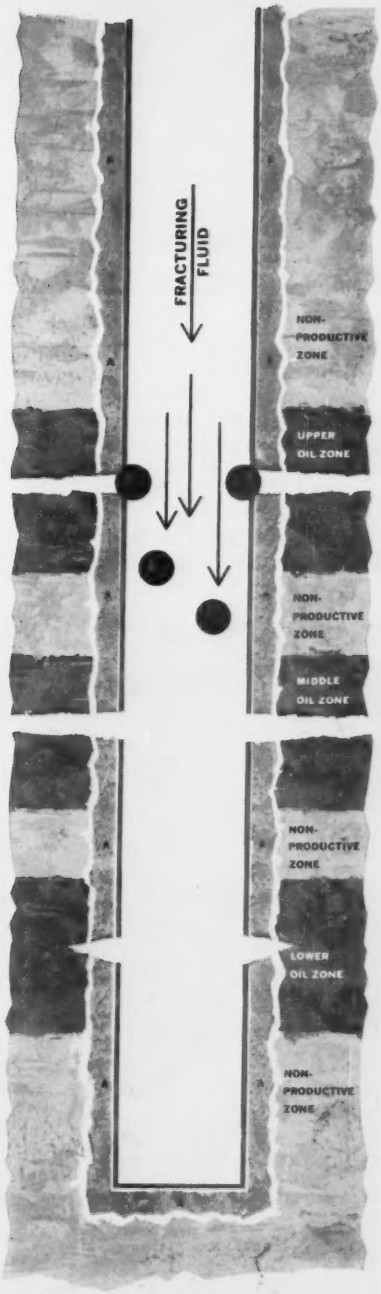
B.F.Goodrich



Deep in an oil well, these balls prove the toughness of Hycar rubber

Each of these balls covered with Hycar nitrile rubber will be used deep inside an oil well to seal off casing perforations taking fracturing fluid. The fluid is used to increase productivity of wells by creating fractures in the underground strata. Multiple fractures are desired, so the balls are needed to seal off perforations leading to existing fractures.

The balls are injected into the fracturing fluid stream finding their own places as pressure forces them onto holes in the casing. Their solid center, of nylon, keeps them from extruding or squeezing through the holes. Their Hycar cover assures that they'll stay resilient and remain effective even under high-temperature conditions, pressure and abrasion. Because of the unusual resistance Hycar offers to hydrocarbons and chemicals, the acidizing or fracturing solutions do not affect these tough Hycar covers.

Here's another sample of the way Hycar provides resilience under the toughest oil-field conditions—of heat, pressure and corrosive influences. It will pay you to get more information about Hycar. Write Department MC-9, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

Ⓐ Sheath of set cement between pipe and wall of hole.

Halliburton Company, Duncan, Oklahoma, uses these balls for its oil well fracturing operations. Balls are covered with Hycar by Oil States Rubber Company, Arlington, Texas. B.F.Goodrich Chemical Company supplies the Hycar rubber.

B.F.Goodrich Chemical

a division of The B.F.Goodrich Company

Hycar

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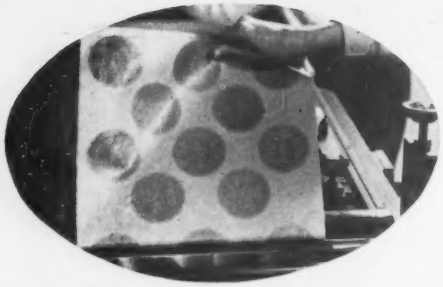
Rubber and Latex



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Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

SEPTEMBER, 1961 VOL. 89, NO. 6

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Highlights Sidelights *of the News . . .*

September, 1961

A proposed merger of the Columbian Carbon Co. and the Cities Service Co. through a pooling of interests was announced on August 24 . . . The merger, subject to the approval of stockholders of both companies, is said to represent an important step forward in the diversification programs of each company (page 990).

According to reports, American trade with the Soviet Union has increased significantly in recent weeks . . . Among American made products shipped to Russia and satellite nations are synthetic rubber and carbon black . . . The Department of Commerce rules that none of these shipments would endanger national security (page 994).

The Chemical Marketing & Research Co. notes that as a result of a recent study it appears as if latex foam rubber is "taking a licking" from flexible urethane and vinyl . . . The company expects that in 1965 750,000,000 pounds of flexible foam (both rigid and flexible) will be produced at a total value of $1 billion (page 998).

General Tire & Rubber Co. has received notification from the Swedish Patent Office of a decision allowing its pending application for a patent covering the company's high-Mooney oil-extended rubber . . . The notification ended six years of waiting by General Tire (page 990).

The Division of Rubber Chemistry of the Chemical Institute of Canada held its annual meeting on August 4 in Montreal, Canada . . . The meeting featured a symposium on "Textiles as Applied to the Rubber Industry" and four other papers of interest (page 992).

Institut Francais du Caoutchouc has announced plans to hold an International Rubber Conference on May 14 to 18, 1962 in Paris . . . The purpose of the conference is twofold; to examine the latest scientific advances which have been made in the production and quality of natural rubber; and to analyze natural and synthetic rubbers in current use (page 994).

There is widespread speculation in the trade that the Ford Motor Co. may be about to establish its own tire producing facilities . . . Before World War II, Ford was engaged in this type of manufacture (page 990).

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coming events

Sept. 21. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Sept. 24-27. American Institute of Chemical Engineers, 45th National Meeting, Lake Placid Club, Lake Placid, N. Y.

Sept. 25-28. Industrial Building Exposition & Congress, New York Coliseum, New York, N. Y.

Sept. 28. Southern Ohio Rubber Group, Fall Technical Meeting.

Sept. 28-30. American Society for Quality Control, Chemical Division, 5th Annual Chemical Conference, Daniel Boone Hotel, Charleston, W. Va.

Sept. 29. Chicago Rubber Group, Technical Meeting, Furniture Club, Chicago, Ill.

Sept. 29. Quebec Rubber & Plastics Group, Fall Smoker, Montreal, Quebec, Canada

Oct. 3. Los Angeles Rubber Group, Technical Meeting, Biltmore Hotel, Los Angeles, Calif.

Oct. 5. Detroit Rubber & Plastics Group, Fall Meeting, Wolverine Hotel, Detroit, Mich.

Oct. 5. Society of Plastics Engineers, Regional Technical Conference on Plastic Foams, Buffalo, N. Y.

Oct. 10. Buffalo Rubber Group, Fall Meeting, Hotel Westbrook, Buffalo, N. Y.

Oct. 10-12. American Standards Association, 12th National Conference on Standards, Rice Hotel, Houston, Texas.

Oct. 12. Northern California Rubber Group, Past-Presidents' Night, Berkeley, Calif.

Oct. 13. Boston Rubber Group, Fall Meeting, Somerset Hotel, Boston, Mass.

Oct. 16-17. Rubber Section, National Safety Council, 1961 National Safety Congress, Conrad Hilton Hotel, Chicago, Ill.

Oct. 17. Elastomer & Plastics Group, Northeastern Section, ACS, Technical Meeting, Boston, Mass.

Oct. 19. Quebec Rubber & Plastics Group, Technical Meeting, Montreal, Quebec, Canada.

Oct. 20. Akron Rubber Group, Technical Meeting, Sheraton Hotel, Akron, Ohio.

Oct. 20. Joint Meeting of New York, Connecticut and Philadelphia Rubber Groups, Henry Hudson Hotel, New York, N. Y.

Nov. 2. Rhode Island Rubber Club, Fall Meeting, Pawtucket Country Club, Pawtucket, R. I.

Nov. 3. Philadelphia Rubber Group, Fall Dance, Manufacturers Country Club, Oreland, Penna.

Nov. 7. Los Angeles Rubber Group, Technical Meeting, Biltmore Hotel, Los Angeles, Calif.

Nov. 16. Northern California Rubber Group, Technical Meeting, Berkeley, Calif.

Nov. 16. Quebec Rubber & Plastics Group, Technical Meeting, Montreal, Quebec, Canada.

Nov. 17. Chicago Rubber Group, Technical Meeting, Furniture Club, Chicago, Ill.

Nov. 17. Connecticut Rubber Group, Technical Meeting.

Nov. 17-18. Southern Rubber Group, Memphis, Tenn.

Nov. 26-Dec. 1. American Society of Mechanical Engineers, Winter Annual Meeting, Statler Hilton Hotel, New York, N. Y.

Nov. 29-Dec. 1. Tenth Annual Wire & Cable Symposium, Berkeley-Carteret Hotel, Asbury Park, N. J.

Dec. 2. Northern California Rubber Group, Christmas Party.

Dec. 7. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Dec. 8. Detroit Rubber & Plastics Group, Christmas Party, Statler Hilton Hotel, Detroit, Mich.

Dec. 8. Los Angeles Rubber Group, Christmas Party, Beverly Hilton Hotel, Beverly Hills, Calif.

Dec. 9. Southern Ohio Rubber Group, Christmas Party.

Dec. 12. Buffalo Rubber Group, Christmas Party, Buffalo Trap and Field Club, Buffalo, N. Y.

Dec. 15. Boston Rubber Group, Christmas Party, Somerset Hotel, Boston, Mass.

Dec. 15. Chicago Rubber Group, Christmas Party, Morrison Hotel, Chicago, Ill.

Dec. 15. New York Rubber Group, Christmas Party, Henry Hudson Hotel, New York, N. Y.

Dec. 26-31. American Association for the Advancement of Science, Chemistry Division Annual Meeting, Denver, Colo.

Jan. 26, 1962. Akron Rubber Group, Technical Meeting, Sheraton Hotel, Akron, Ohio.

Jan. 30-Feb. 2, 1962. Society of Plastics Engineers, 18th Annual Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Penna.

Feb. 5-9, 1962. ASTM Committee Week, Statler Hilton Hotel, Dallas, Texas.

Feb. 7-9, 1962. Committee D-11 on Rubber and Rubber-Like Materials, ASTM, Statler Hilton Hotel, Dallas, Texas.

Feb. 8, 1962. Fort Wayne Rubber & Plastics Group, Technical Meeting, Van Orman Hotel, Fort Wayne, Ind.

March 2-4, 1962. Boston Rubber Group, Ski Weekend.

March 20-29, 1962. American Chemical Society, 141st National Meeting, Washington, D. C.

March 23, 1962. New York Rubber Group, Spring Meeting.

April 5, 1962. Akron Rubber Group, Technical Meeting, Sheraton Hotel, Akron, Ohio.

April 24-27, 1962. Division of Rubber Chemistry, American Chemical Society, Hotel Statler, Boston, Mass.

April 26, 1962. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

May 22-25, 1962. Institution of the Rubber Industry, 4th International Rubber Technology Conference, Church House, Westminster, London, England.

June 7, 1962. New York Rubber Group, Summer Outing.

June 22, 1962. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 24-29, 1962. ASTM Annual Meeting and Apparatus Exhibit, Hotel Statler, New York, N. Y.

August 2, 1962. New York Rubber Group, Golf Outing.

Sept. 9-14, 1962. American Chemical Society, 142nd National Meeting, Atlantic City, N. J.

Sept. 30-Oct. 5, 1962. ASTM Pacific Area Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles, Calif.

Oct. 16-19, 1962. Division of Rubber Chemistry, American Chemical Society, Hotel Cleveland, Cleveland, Ohio.

Oct. 19, 1962. New York Rubber Group, Fall Meeting.

Nov. 25-30, 1962. American Society of Mechanical Engineers, Winter-Annual Meeting, Statler Hilton Hotel, New York, N. Y.

Dec. 14, 1962. New York Rubber Group, Christmas Party

Feb. 4-8, 1963. ASTM Committee Week, Queen Elizabeth Hotel, Montreal, Quebec, Canada.

March 31-April 5, 1963. American Chemical Society, 143rd National Meeting, Los Angeles, Calif.

May 7-10, 1963. Division of Rubber Chemistry, American Chemical Society, Royal York Hotel, Toronto, Ontario, Canada.

Sept. 10-13, 1963. Division of Rubber Chemistry, American Chemical Society, Hotel Roosevelt, New York, N. Y.

April 28-May 1, 1964. Division of Rubber Chemistry, American Chemical Society, Sheraton-Cadillac Hotel, Detroit, Mich.

Sept. 1-4, 1964. Division of Rubber Chemistry, American Chemical Society, Sherman Hotel, Chicago, Ill.

May 4-7, 1965. Division of Rubber Chemistry, American Chemical Society, Fountainebleau Hotel, Miami Beach, Fla.

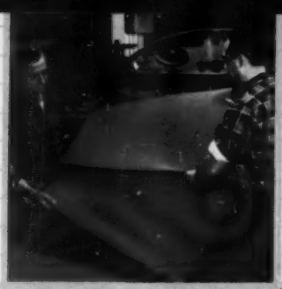
Oct. 19-22, 1965. Division of Rubber Chemistry, American Chemical Society, Bellevue-Stratford Hotel, Philadelphia, Penna.

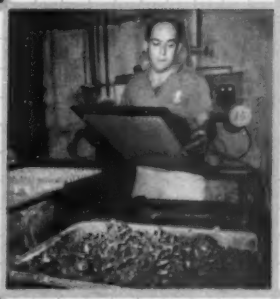
May 3-6, 1966. Division of Rubber Chemistry, American Chemical Society, Fairmount Hotel, San Francisco, Calif.

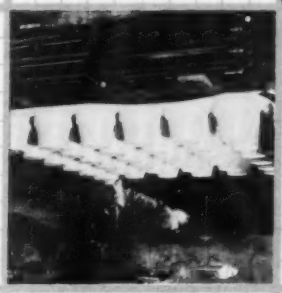
Sept. 13-16, 1966. Division of Rubber Chemistry, American Chemical Society, New York, N. Y.

May 2-5, 1967. Division of Rubber Chemistry, American Chemical Society, Queen Elizabeth Hotel, Montreal, Quebec, Canada.

Sept. 12-15, 1967. Division of Rubber Chemistry, American Chemical Society, Sherman Hotel, Chicago, Ill.







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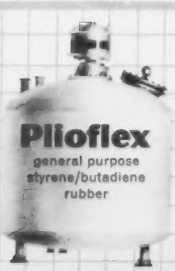

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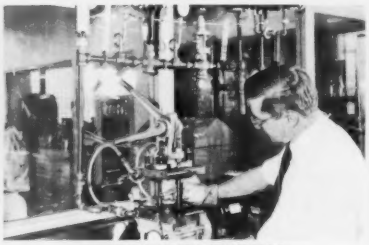

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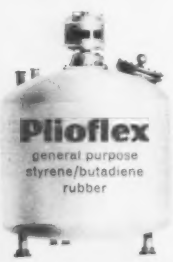

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As Ken Soule Sees It

by Kenneth J. Soule

Home Runs All Over the Place

The year 1961 has blossomed into a press agent's field day, as far as the New York Yankees are concerned. The home run, which has always been a crowd pleaser and a lodestone at the box office, has once again become the biggest thing in big league baseball. This has come about—as the reams upon reams of copy in all manner of periodicals, and the re-hash on radio and TV amply testify—because both Mantle and Maris of the Yankees seriously threaten to break Babe Ruth's 1927 record of 60 home runs.

Whether or not either or both sluggers accomplish the feat is of somewhat academic interest as far as this discussion is concerned. Our main concern—as well as that of a host of other wonderers about the matter—is *why* should there be such an avalanche of round trippers during 1961—many more in fact than during any season for the past 30 years. Everybody and his brother seem to be getting into the act.

Various reasons have been suggested for the current slugfest. One has been that the pitching is substandard, especially in the American League, due at least in part, to the expansion to 10-team size. No doubt there is considerable merit in this idea. The pitching *is* moderately mediocre in both leagues, but it is not that bad. Another suggestion is that the ball in play is changed so often that it almost never gets a chance to be even slightly scuffed or softened up a bit. There appears to be a good deal of meat in this thought. Nowadays, the plate umpire seems to spend almost as much time chucking baseballs out of play as he does attending to his other duties. The net result is that a practically new ball is always being used, while in the "old days" ball changes were few and far between. Undoubtedly, the pitchers also are much more restricted than formerly, what with spitballs, emery balls, and shine balls having been put on the *verboten* list. But this restriction has been in effect for quite a number of years and so it has no real bearing on the 1961 story.

So we inevitably come to the fundamental question, "Is the official big league baseball more lively now than it used to be?" The manufacturer—A. G. Spalding and Bros.—stoutly insists that "the major league baseball is unchanged," and the company's president, Edwin Parker, is further quoted as saying that "the specifications are exactly the same as in 1926." This latter statement means precisely nothing since the only actual specification requirements (as far as I can find out) are that the sphere must be between 9 and 9¼ inches in circumference and weigh between 5 and 5¼ ounces. Presumably, it must also look like a baseball.

Spalding also reveals that its pride and joy has a "cork center surrounded by a layer of black rubber, a layer of red rubber, 121 yards of rough gray wool, 45 yards of white wool, 53 yards of fine gray wool, 150 yards of white cotton, a coating of rubber cement, and a horsehide cover. Each step in the process, including hand stitching, is carried out precisely as it was 35 years ago." This is interesting, but it actually does not mean a great deal. In a product made up of so many diverse items, built up layer by layer, the only test which would have any real significance would be a determination of resiliency, rebound, or liveliness of the *finished product*. This would be very simple to set up, and could include a drop test and measurement of the rebound under carefully standardized conditions of temperature, humidity, and atmospheric pressure. The results of such properly conducted laboratory tests would furnish data from which a meaningful specification could be written to cover baseballs acceptable for major league use.

We suspect, however, that since home runs pull in the customers it would be considered good business to keep surrounding the whole matter with as much mystery as possible. Therefore, lets not hamstring the manufacturer by too rigid a spec. If the baseball is livelier, (as it probably is) who cares, as long as the ballyhoo and the press agentry keep up the box office interest. As for the present hail storm of home runs, all the items mentioned above have probably contributed. Plus an important change in baseball itself. Place hitting, bunting, squeeze plays, and other items of scientific attack have given way to out and out slugging. Everyone wants to be a home run hero. The prestige and the money lie there. The net result, most batters swing from their shoe tops.

But, while Ruth's record of 60 home runs may fall this year, I would gamble that the one he set of over 50 per year, (54, 59, 60 and 54) spread over a nine-year period, will *never* be topped. Any takers?

New Surgical Methods

According to recent items in the daily press, drastic innovations in post-operative procedures are being studied intensively overseas, and are making considerable headway there.

(continued on page 896)

One of the processes involved is that of stapling internal surgical wounds instead of sewing them, as is customarily done. Stuart H. Loory, writing in the *New York Herald Tribune,* reports on this new development. The instrument employed in the new type repair work is quite similar to an ordinary stapling gun, but is chrome-plated and uses tantalum staples. The equipment and the process are being demonstrated in this country by a Soviet delegation composed of two surgeons, an engineer, and an export specialist. The advantages claimed for the mechanical repair work are: that it is very much faster than conventional needle and catgut sewing (4 seconds vs. 35 minutes in one case); and that blood vessels too small to be fastened by sewing can readily be stapled.

As might be expected, there is disagreement among medical men in this country both as to the novelty of the Russian procedures, as well as the success to be attained by their use. Some surgeons claim that the equipment was not invented by Russians but is based on earlier work by "Germans, Hungarians, French, and Rumanians." Also that the machines are not as good, nor as widely used as claimed. Other American surgeons are said to have had good results with the instruments.

In Japan, a group of 11 surgeons, headed by Prof. Seiji Kimoto, of the Tokyo University Medical School, has developed a distinctly different method of making post-operative repairs. In place of the conventional needle and "thread," they use an adhesive to do the necessary patching up work, following surgery. As William T. Plunkett, in a UPI dispatch, explains it, the particular adhesive selected after a long period of experimentation was Eastman 910. It is claimed that this material was found to have strong and rapid adhesive properties, so that needed repairs could be accomplished in a very few minutes. In addition, the adhesive was "harmless to human organs, easy to sterilize, and non-deteriorative at normal body temperatures." Finally, it was found to be absorbed into the body within a few weeks.

So there you are! If any of you should unfortunately require surgery, either staples or stick-um may be available to put you back together again. And the "cat gut" saved can be put to good use for stringing your tennis racket or violin, as soon as you feel like playing either instrument again. . . .

Fall Fashions

The use of plastic foam laminates and interliners has already created a virtual revolution in the world of fabrics and fashions. Warmth, without excessive bulk or weight, has now become commonplace in the woven goods field.

According to an item in *Plastics World,* a similar transformation is taking place in the realm of knit goods. As Benjamin Collins, general manager of Nopco Chemical Company's Plastic Division, sees it, fall knitwear embodying foam laminates is "taking the apparel trade by storm" in England, Germany, Sweden, and New Zealand, based on original developments in this country. Urethane foam, bonded to knit fabrics to form an integral fabric-foam laminate, is said to provide "warmth, feather weight, crease and wrinkle resistance, and excellent hand and drape."

One important and reliable measure of the extent of the laminated knit goods take-over is shown by yardage produced. From a figure of almost zero in 1959, this has risen to an astonishing 15 million yards in 1960 and an almost unbelievable 90 million yards in 1961! The corresponding dollar volume of foam sheeting made specifically for knit yard goods was about $7 million in 1960 and approximately $40 million in 1961. These are figures to warm the cockles of the heart of foam sheeting producers, as their product in its turn will help to keep many of us warm when the wintry breezes blow.

Blimps Again

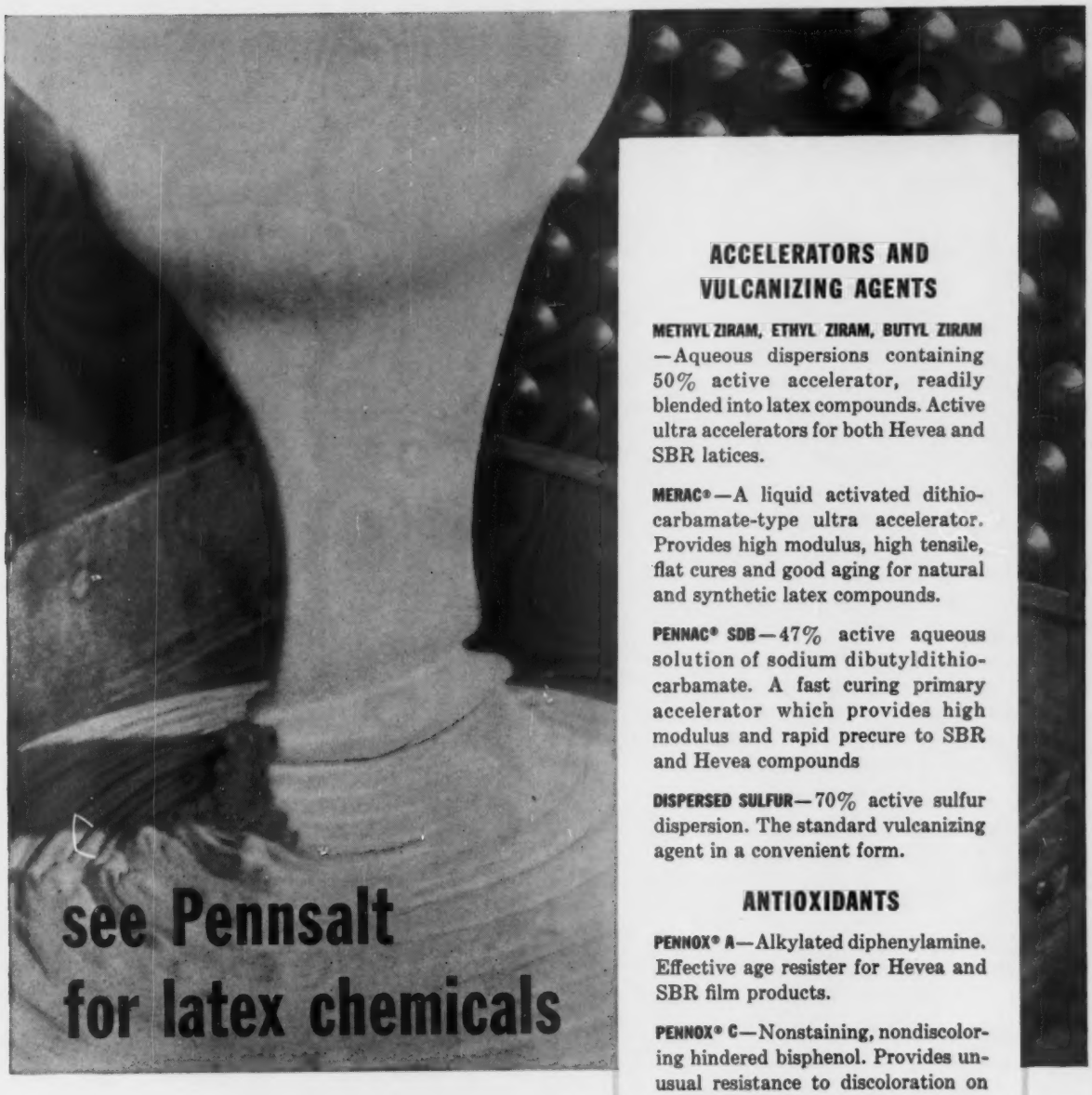
At the time of this writing, the previously reported phase-out order regarding blimps at Lakehurst still stands. Under its terms, eight of the ten non-rigid dirigibles there were to be deflated by November 30, 1961, and the other two to remain in research and development service for one more year.

It is not clear how our newly activated defense preparations will affect the blimp retrenchment program. With battleships being de-mothballed, it is possible that the lighter-than-air craft at Lakehurst may be granted a reprieve. This might well be so, in view of their magnificent service in past wars, as well as the fact that the United States is blessed with a virtual monopoly of the non-inflammable gas, helium, with which they are inflated.

In the meantime, and regardless of the eventual decision as to the future of our blimps, a new and important use has been discovered for them. As reported in the *New York Herald Tribune,* Professor David C. Hazen, head of the subsonic laboratory, Forrestal Research Center, Princeton, N. J., envisioned, and now has put into practice the idea of using Navy dirigibles as flying wind tunnels. Previously, to test models of slow speed aircraft such as helicopters and turbo-wing planes requiring a short runway, it was necessary to employ expensive and cumbersome wind tunnels. These devices also had the inherent drawback that the prop-wash from the aircraft being tested bounced off the walls of the tunnels and set up counter currents.

Under Dr. Hazen's new test procedure, the test model is attached to its own flight boom in a compartment below the gondola of one of the Navy blimps. Then when the blimp is in flight, the boom and attached experimental machine are lowered through doors opening underneath. Data on the performance of the model is transmitted to instrument panels on the blimp itself. Besides its other virtues, this type of "flying wind tunnel" has the immense advantage that any test can easily be continued as long as necessary, and the air speed during the test varied from 0 to 60 knots, at will.

So perhaps we shall be seeing the graceful Navy blimps aloft not only this summer, but for many years to come. Let us hope it turns out that way. . . .



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capitol cues

THE CURRENT PAUSE IN THE RECOVERY IS ONLY TEMPORARY, say economists in government and industry. They see no cause for worry or change in plans. The pause is normal...a breathing spell...typical of every business upturn. Indeed, the analysts have been expecting some slowing of the Spring tempo. They are also expecting the breather to end very shortly--with the Summer.

> The causes of the Summer slowdown were partly seasonal--the result of vacation shutdowns in steel and other lines, early model changeovers in autos, etc. The breather is also a by-product of the upturn's first phase; a switch from inventory liquidation to accumulation can lose momentum temporarily while waiting for consumers to react to job and income gains.
>
> The Fall improvement will come from three main factors:
> -Business itself will provide lift through stepped-up outlay for inventory, research, and for new plant and equipment.
> -The consumer will respond to longer workweeks, high wages, and new jobs by swelling spending--especially for durables.
> -Federal spending will be the most important--largely those extra billions in defense expenditures prompted by Soviet Russia's repeated and menacing saber-rattling over Berlin.

CONSTRUCTION MAY PROVE TO BE THE BIG SLEEPER of this business rise. It hasn't been getting much attention, but it's roaring along at near-record rates--and at the highest clip in two years. What's more, there are good prospects for substantial increases to come. Spending for public works is up 10% over 1960--mainly highways. Private building is trailing '60 by 2%. Much of the lag is a result of the recession-caused slump in home-building.

> But home-building is now picking up. Lower mortgage rates--and the huge, recently passed housing law--will give demand a big stimulus, with the bulk of the impact hitting in 1962. Home-building helped turn several earlier upturns into booms.

DON'T RULE OUT A STEEL PRICE INCREASE later this year. To be sure, the Administration is putting pressure on the mills to hold the line; and foreign and domestic competition may keep the lid on a few scattered items. But, despite threats of new Congressional anti-monopoly investigations, the producers may find themselves forced to lift prices by new cost increases.

> The companies must increase wages for the third time under the contract signed early last year. Up to now, they have absorbed the hikes, but profit margins are already squeezed. Higher steel prices would lift costs for a big range of U.S. industries--autos, appliances, machinery, and construction.

PRICE AND WAGE CONTROLS ARE BEING STUDIED by government officials for possible enactment by Congress on a stand-by basis in the Berlin crisis. They're not ready to ask for the power, knowing that Congress won't give it short of shooting. But the experts want to determine what would be needed.

capitol cues (cont'd)

THE BIGGEST LABOR ORGANIZING DRIVE IN U.S. HISTORY is being charted by James Hoffa, recently reelected President of the huge Teamsters' Union. His membership has just voted him broad new powers, plus a large war chest. Hoffa's immediate target is a 300,000 increase in his membership--from the 1.5 million or 1.7 million figure that's variously attributed to the Union.

> The Teamsters will invade new areas--even in manufacturing. Targets will include plants in apparel, textiles, plastics, and in electronics. In general, Teamster organizers will go after virtually any group that's unorganized and organizable.

NEW PROPOSALS FOR HANDLING BIG LABOR DISPUTES will be pushed hard by the Administration and Labor Secretary Goldberg, the proposals' author. They're meant to give the government flexible alternatives to injunctions now called for under the Taft-Hartley Act--something Democrats have wanted.

> Specifically, here's some of the changes being contemplated:
> -Giving fact-finding boards new powers to mediate disputes threatening the economy, plus power to suggest settlements.
> -Permitting longer injunctions than today's 80-day periods.
> -Authorizing temporary seizure of plants pending solutions.
> The issues are too thorny for Congress to act this year, but the groundwork will be prepared for sweeping action in 1962.

UNION LEADERS ARE GROWING INCREASINGLY HOSTILE to President Kennedy, the man they were sure was going to take their policies to the White House. Main cause of their ire is the Administration hold-the-line policy on wages as well as prices, drafted in efforts to check any new round of inflation. Labor chiefs like Walter Reuther fear Kennedy's Labor-Management Commission will be induced to set a policy that will hamper efforts to lift benefits. The labor men are also angry at Kennedy's delay in pushing welfare bills.

THERE'S A NEW NOTE OF CONFIDENCE AMONG KEY OFFICIALS in Washington. Reporters detect this in many areas--especially at State and the Pentagon. It is a notable change from the gloom and nervousness that followed Cuba. Now, U.S. leaders are approaching key problems with steadier frames of mind. They're not all-out optimists. But they feel we can cope with Soviet jabs.

> Passage of time has eased the shock of Cuba and the losses in Laos. Also Kennedy's trip abroad restored relations with allies. And there have been changes in how key policies are made; Kennedy has new advisers and leans on them more and more.

WHO DOES KENNEDY LISTEN TO MOST THESE DAYS? There has been a change of considerable importance in recent months in the names of his principal advisers. The White House assistants are still there and still close to the President. But the words that contribute to major decisions now come from a clearly identified crew outside the White House--mainly the Cabinet.

> Here's the line-up for the key areas of national policy:
> -Foreign policy--It's Secretary Rusk, not Rostow or Bundy.
> -Defense--General Taylor is mapping basic military strategy.
> -Economics--The Treasury's Dillon, not the Economic Council.
> -Politics--Brother Robert is far and away most influential.

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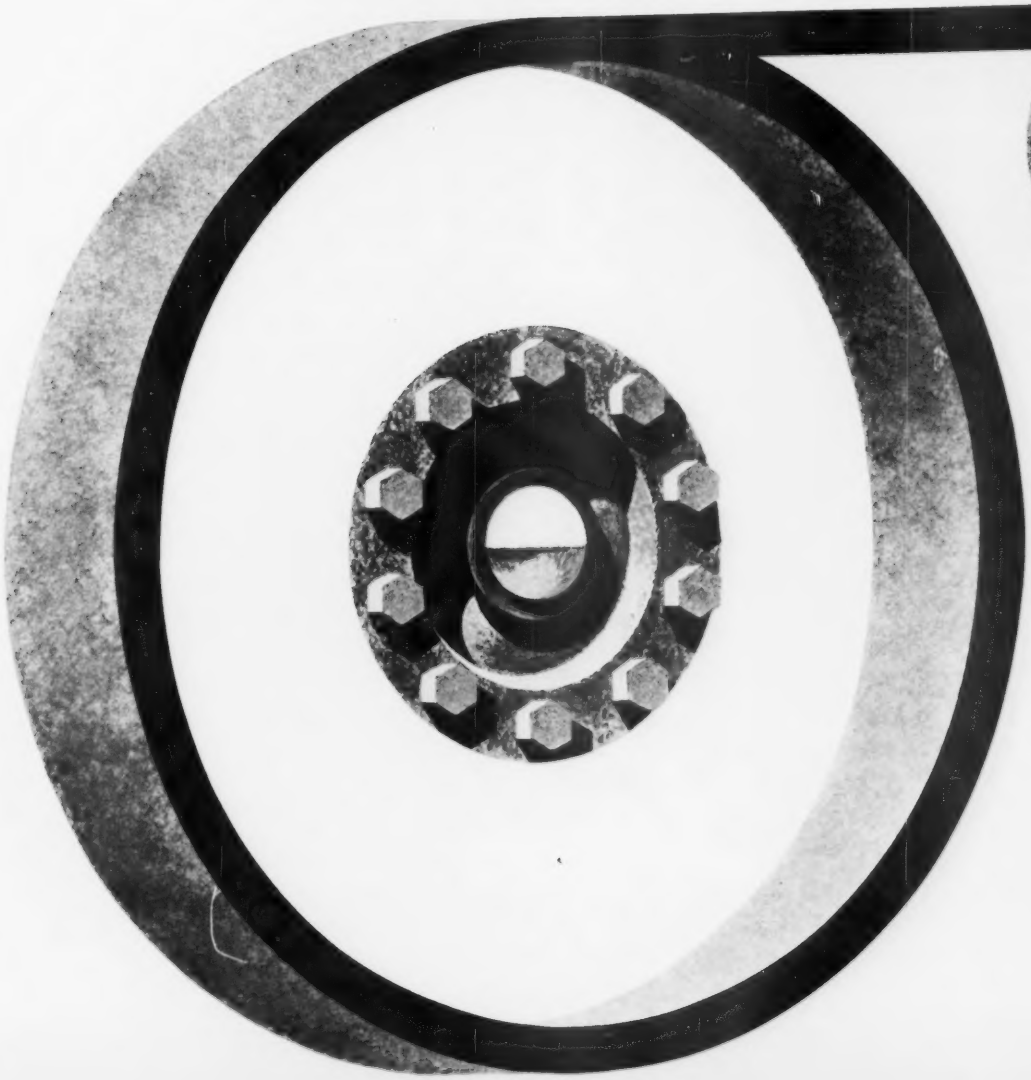

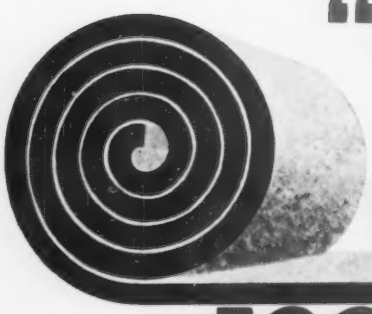

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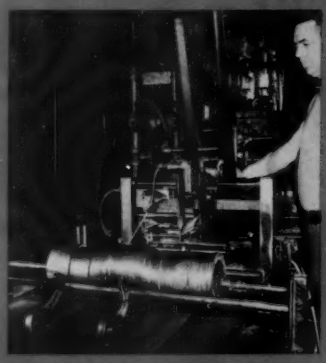

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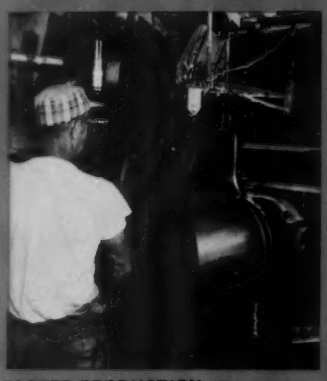

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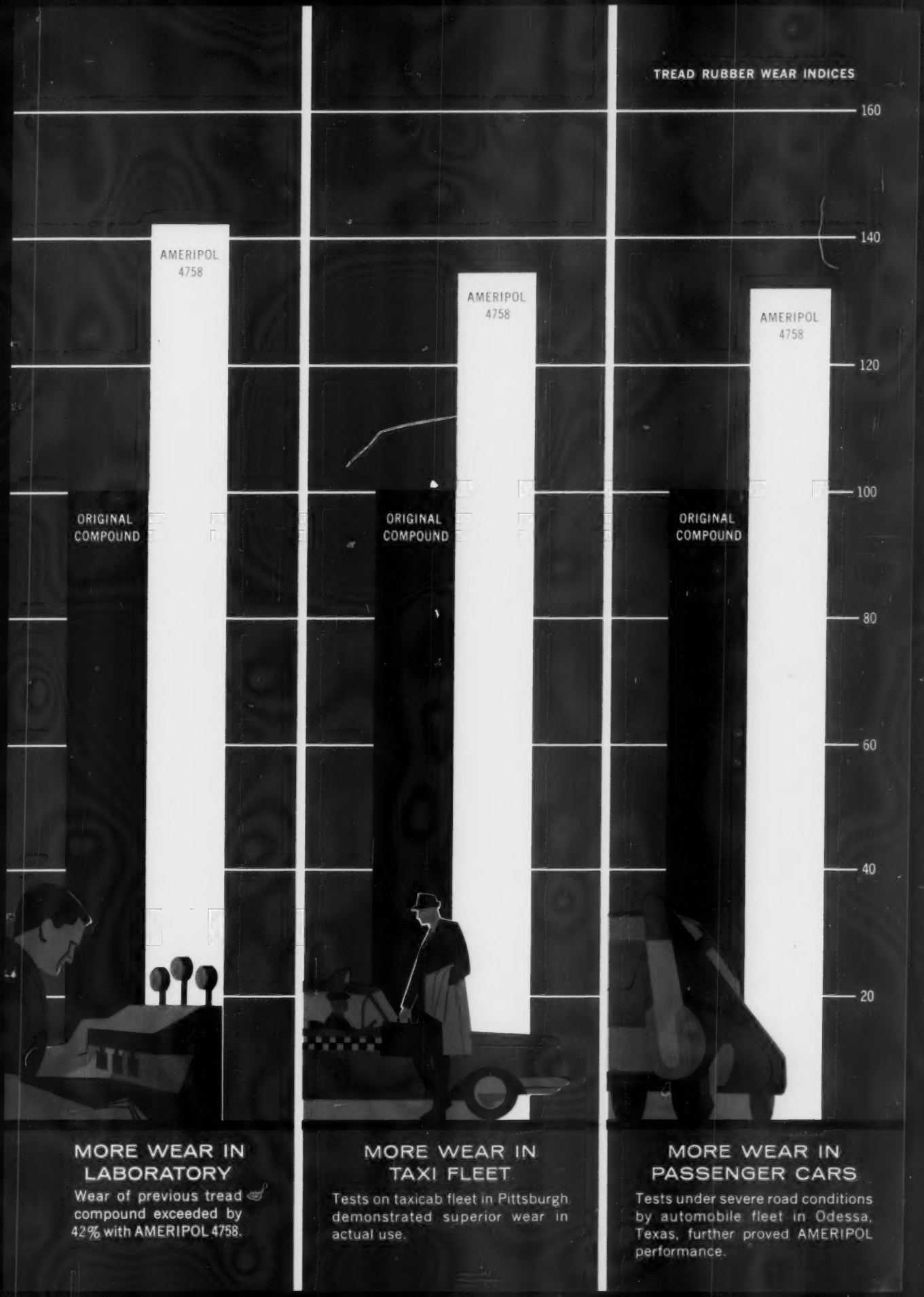

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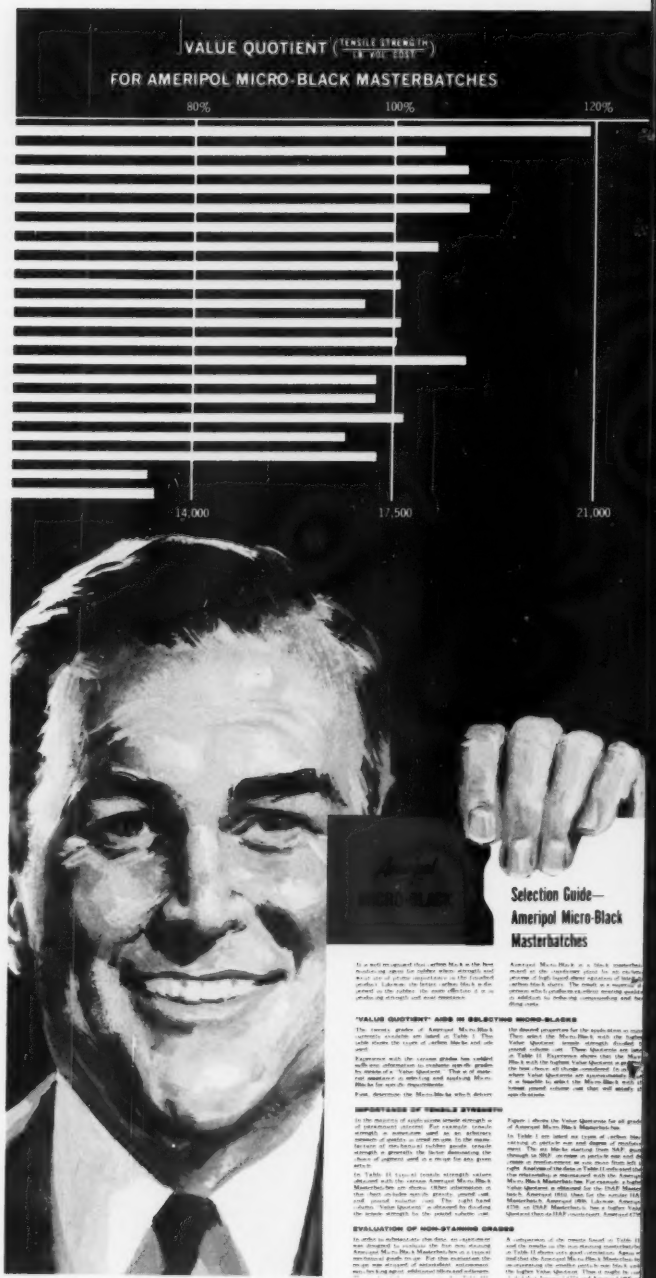

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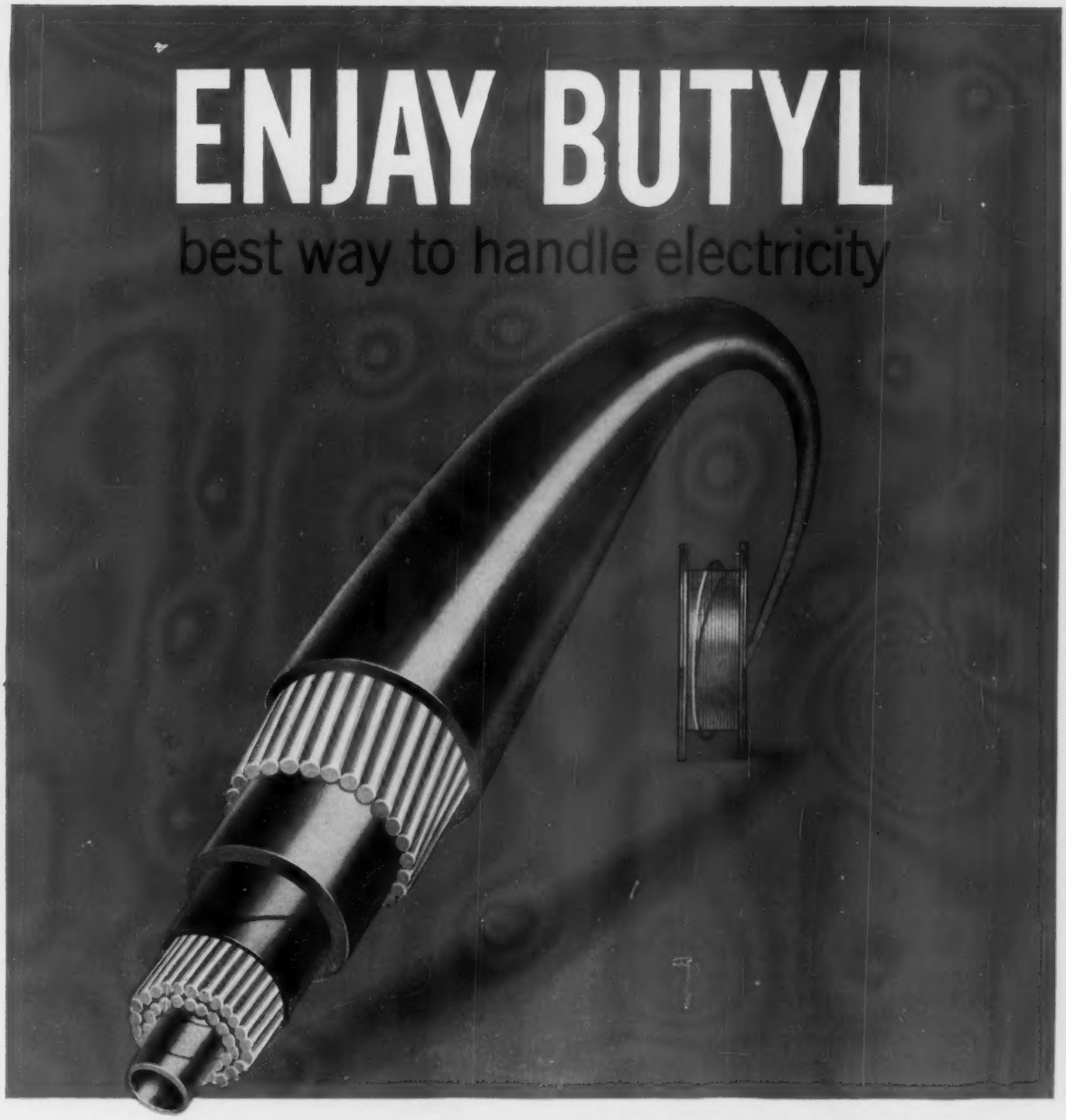

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Overseas

Great Britain—Vickers-Armstrong is negotiating to sell plants to the Soviet Union for making butadiene-styrene synthetic rubber and for producing polypropylene for general textile use. The British firm and Hans Zimmer, Vickers' German engineering partner, have also signed a contract, under which Zimmer will design an $11.2 million nylon 66 fiber plant for the Soviet Union, while Vickers will fabricate the equipment. The 6,000 ton per year unit should go on stream in 1964.

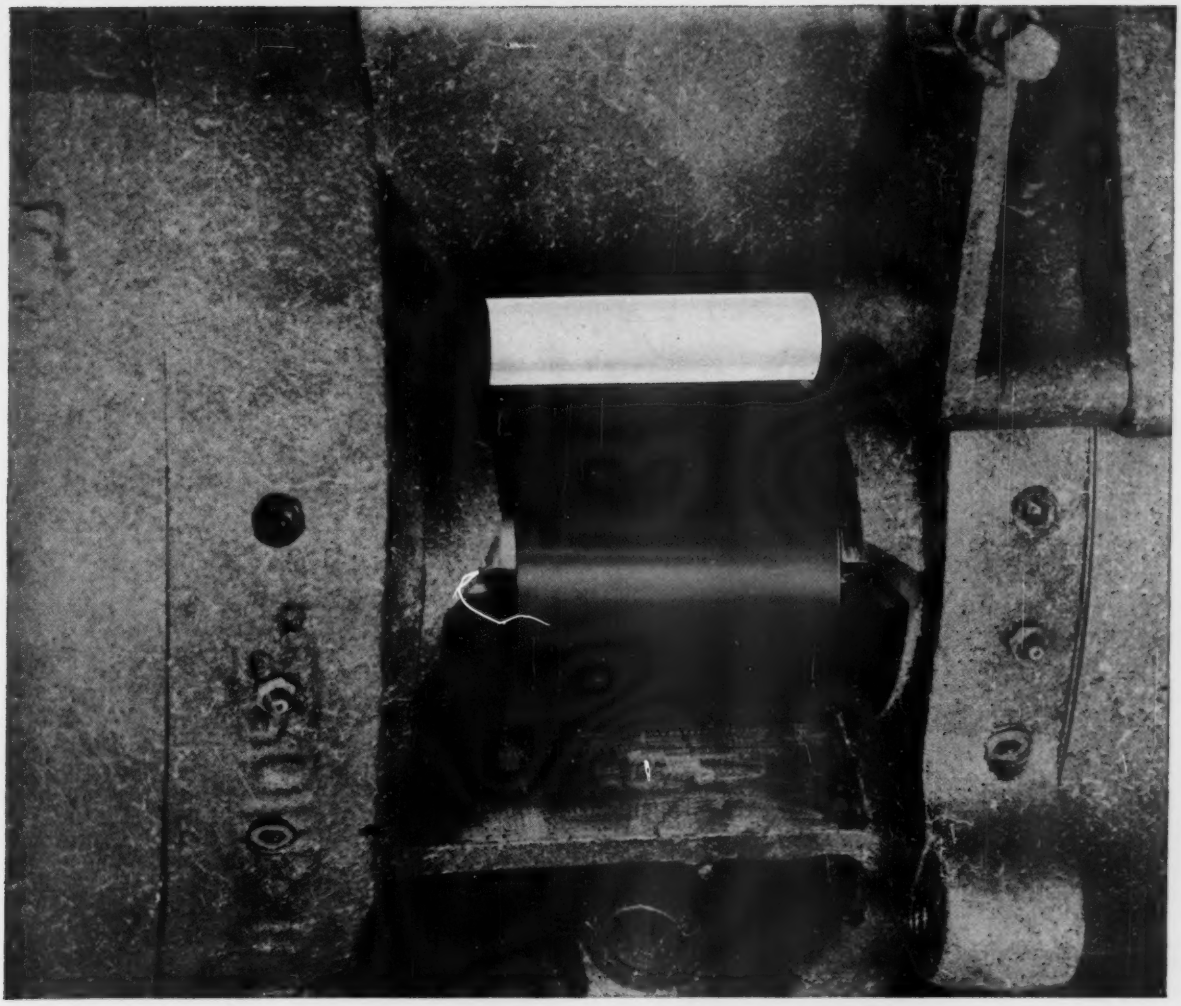
England—The International Synthetic Rubber Co. Ltd., Hythe, Southampton, is now operating the first large-scale plant in the United Kingdom for the production of high solids butadiene-styrene rubber latex. Synthetic rubber latex with a low solids content is produced as part of the process for the manufacture of solid SBR, and there are several methods for the production of latices with a high solids content.

Japan—Bridgestone Tire Co. of Tokyo will produce *cis*-polybutadiene synthetic rubber using a process licensed by the Phillips Petroleum Co., Bartlesville, Okla. The Tokyo firm will build a 10,000 ton per year plant in Japan, using the Phillips process. Phillips, in addition to furnishing the rubber process, will serve as technical adviser on engineering, construction and initial operation of the facility.

France—Cie Francaise de Raffinage and United Carbon France have signed a contract under which the French firm will supply United Carbon France with aromatic hydrocarbons for the production of carbon black. The carbon black will be marketed in France and other European countries, and will be produced at the plant at Port Jerome near Le Havre, now under construction.

England—Du Pont Co. (United Kingdom) Ltd. will build a plant for the manufacture of isocyanates, a basic raw material used in the production of urethane foams, on its plant site at Maydown, near Londonderry, Northern Ireland. The multi-million dollar facility will supply Hylene organic isocyanates for rigid and flexible foams for markets in the United Kingdom and for export to other countries in the Free Trade Area. Construction will begin later this year, and the plant is expected to be in operation late in 1963.

The Netherlands—AKU and the B. F. Goodrich Tire & Rubber Co. are reportedly preparing to increase the capacity of the Ciago synthetic rubber plant at Arnhem to 30,000 tons per year, doubling the plant's output. The unit is a joint AKU-Goodrich venture.



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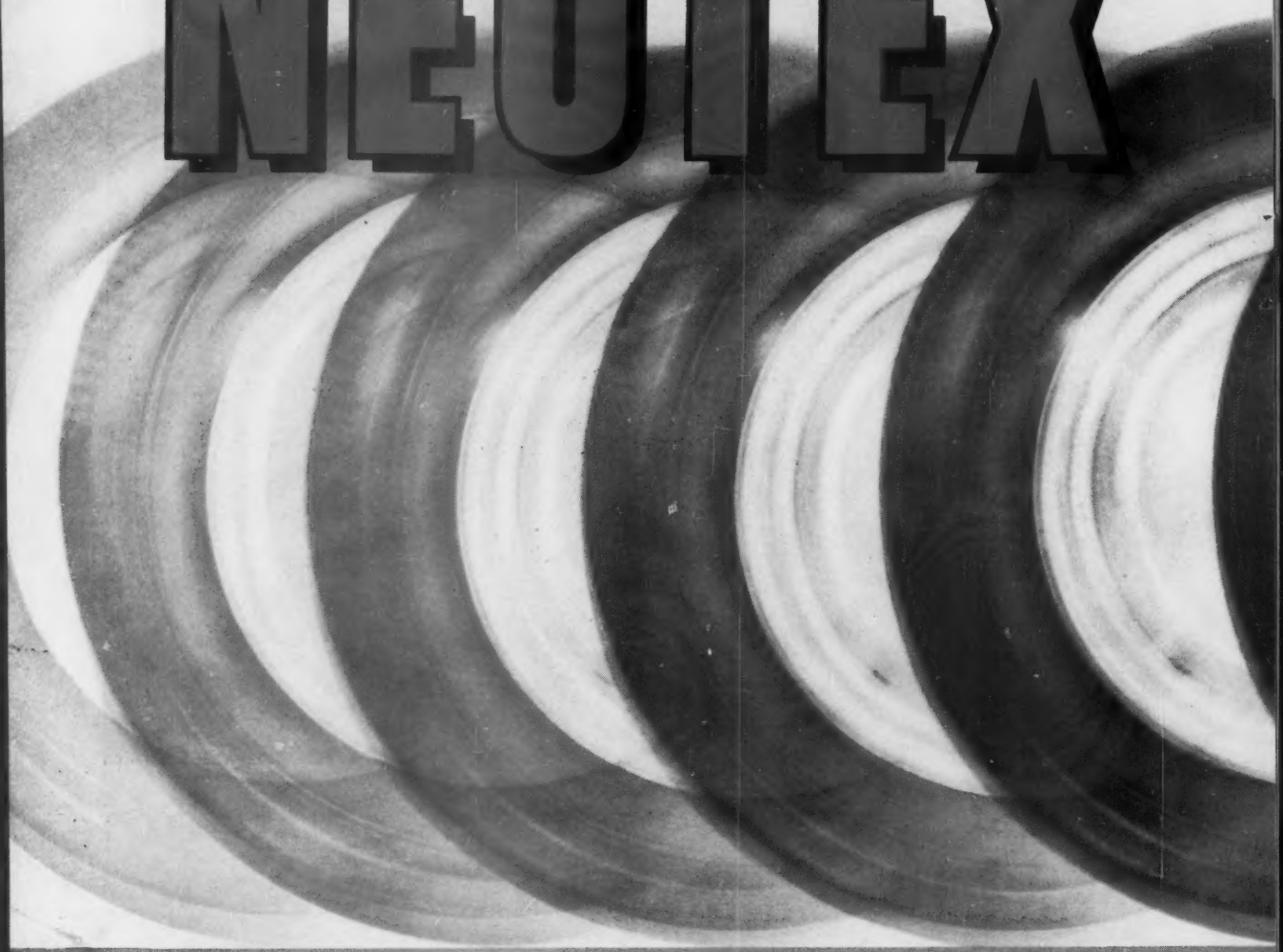

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Once again, with the development of the NEOTEX series, Columbian has led the way for finer-quality products, both in tires and industrial rubber goods. Through NEOTEX, the compounder can get oil furnace blacks that provide high tensile, low modulus and low hardness. And now, with the *immediate availability* of NEOTEX, you have the quality carbon black you asked for: good wear, less noise, softer ride. Contact your Columbian representative . . . and send off the coupon for the whole story . . . *today*!

COLUMBIAN CARBON COMPANY

380 Madison Avenue, New York 17, N. Y.

Branch offices and agents in principal cities

how to increase the useful life of rubber...

Effect of Curing System on Antiozonant Retention in SBR Stocks after Vulcanization

(All contain 3.0 phr UOP 88; 40.0 phr HAF black)

Compound	Accelerator	Sulfur, phr	% Extractable Antiozonant
1082....	2.0 phr benzothiazyl disulfide	2.0	66.4
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1087....	None	2.0	~100.0
1088....	1.0 phr benzothiazyl disulfide	3.0	74.6
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1089....	1.0 phr benzothiazyl disulfide	1.0	88.6
1083....	1.0 phr benzothiazyl disulfide	2.0	79.6
1084....	1.0 phr N-cyclohexyl-2-benzothiazole sulfenamide	—	—
1093....	1.0 phr diphenylguanidine	2.0	~18.0
1085....	2.0 phr tetramethylthiuram disulfide	—	35.0
1090....	4.0 phr tetramethylthiuram disulfide	—	12.9

The SBR specimens below were exposed to ozone at 100°F with 20 percent elongation for 52 hr. at 33 pphm ozone, then 187 hr. at 63 pphm ozone.

Carbon black—HAF (high abrasion furnace), Curing system—4 phr tetramethylthiuram disulfide; Hours to first crack—7 to 23.

Carbon black—HAF (high abrasion furnace), Curing system—2 phr sulfur, 1 phr N-cyclohexyl-2-benzothiazole sulfenamide. No cracks in 239 hr.

CONSIDER THE EFFECT OF YOUR CURING SYSTEM ON THE EFFECTIVENESS OF A CHEMICAL ANTIOZONANT

In compounding rubber, there are several things which are important in assuring maximum crack-free life. First, you must use a potent antiozonant like UOP 88 or 288. Next, consider what a vast difference in effectiveness can be realized by your *curing system*.

The right antiozonant used in correct proportion is of primary importance. Then, by using the proper accelerator, you can promote its maximum effectiveness, and thus contribute to maximum ozone protection.

Look at the two rubber test strips illustrated. Both were formulated with UOP 88 . . . but note how much more effectively the antiozonant worked when accompanied by this change in curing systems—a vast increase in resistance to cracking. The table above the test strips shows how the *proper* accelerator aids antiozonant effectiveness.

Help in achieving maximum effectiveness from UOP 88 or 288 antiozonants in your rubber formulations is available through UOP facilities and technical personnel. Just write or telephone our Products Department.

WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

UOP®

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road,
Des Plaines, Illinois, U. S. A.

UOP ozone cabinets provide test conditions at a wide range of ozone concentrations.

Advertising is sometimes like fishing . . .

If you fish, you may not catch fish;
If you don't fish, you won't catch anything.

(APPLETON)

No one can guarantee to make every advertisement successful under all circumstances, but experience does suggest a few simple rules that can help.

Obviously, the first is to pick the right media. Next would be to prepare good advertising of the kind that appeals most to the reading audience you are reaching.

If you would like to see the kinds of advertising that have proved to be successful in rubber, send for a copy of the booklet, "How to advertise effectively to the rubber industry." No charge or obligation, of course.

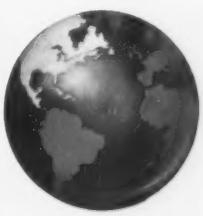
Then, if you'd like to put good advertising to work in the right media, use RUBBER AGE and RUBBER RED BOOK, the rubber industry's most powerful combination. Ask for rates or perhaps assistance in building a good campaign.

published by

PALMERTON PUBLISHING CO., INC.

Publishers of ADHESIVES AGE • RUBBER AGE • RUBBER RED BOOK
101 West 31st Street • New York 1, N. Y. PE 6-6872

Look around the



globe...

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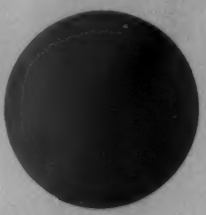
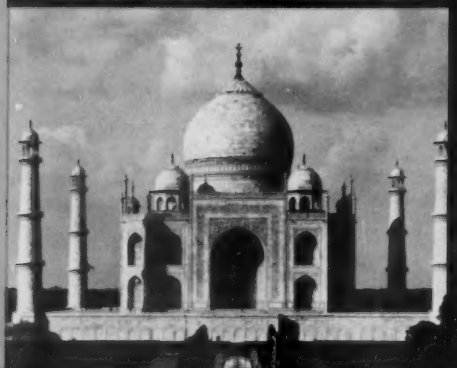
- *Cabot is the world's largest producer of carbon black . . . the only producer of all three major types (furnace, thermal and channel) . . . offering more different grades than any other manufacturer.*
- *Cabot has more production facilities abroad — more oil furnace black plants world-wide than any other manufacturer. That means fewer problems for you — in shipping and exchange.*
- *Not just more facilities — but the very best facilities for production and quality control to assure the same uncompromising level of quality the world over. And Cabot's non-stop programs of research and development provide continuing assurance that you are buying the very finest in carbon black available.*
- *Better technical service — Cabot offers the convenience of a highly trained technical staff — world-wide — to help you find fast, economical solutions to your carbon black problems wherever you may be.*
- *No magic to it. All you have to do is pick up your phone and get in touch with the nearest Cabot man. He'll be happy to provide you with complete information.*





you'll find

CAB T!

Globe-trotter extraordinary — that's the Cabot trade-mark! Wherever carbon black is sold — in 58 different countries, on all six continents — it has long since come to be known as a five-letter word meaning the best in carbon black.

Cabot sells more carbon black than anyone else . . . more different grades than anyone else. And Cabot is first to offer the ease and convenience of color-coded packaging, now standardized world-wide.

Through its international production and marketing complex, Cabot delivers to the rubber industry of the world the greatest variety of carbon blacks available — but only one kind of service: the best in the industry.

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Sales representatives in all principal cities of the world,

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DALLAS, TEXAS — 1309 Main Street — RIverside 1-6117
LOS ANGELES 5, CALIFORNIA — 3350 Wilshire Boulevard — DUnkirk 2-7333
NEW BRUNSWICK, NEW JERSEY — 46 Bayard Street — KIlmer 5-1828
NEW YORK 17, NEW YORK — 60 East 42d Street — YUkon 6-7127

ARGENTINA — **Cabot Argentina S.A.I. yC.**, Sarmiento 930-2°A, Buenos Aires
CANADA — **Cabot Carbon of Canada, Ltd.**, 121 Richmond Street West, Toronto 1, Ontario
ENGLAND — **Cabot Carbon Limited**, 62 Brompton Road, London, S. W. 3
FRANCE — **Cabot France S.A.**, 45, rue de Courcelles, Paris 8
ITALY — **Cabot Italiana S.p.A.**, Via Larga 19, Milano
AUSTRALIA — **Australian Carbon Black Pty. Limited**, Millers Road, Altona, Victoria (jointly owned)

Printed in U.S.A. September, 1961

What's your pleasure in SBR?

ASRC has a polymer for every purpose!

DESIGNATION	TYPE	STAB.	EMUL.	COAG.	OIL TYPE·AMOUNT	% STYRENE	% TOTAL ASH	RAW MOONEY
GENERAL PURPOSE TYPES								
1000	Hot	ST	FA	SA		23.5	0.80	50
1006	Hot	NS	FA	SA		23.5	0.80	50
1500	Cold	ST	RA	SA		23.5	0.80	50
1502	Cold	NS	FA/RA	SA		23.5	0.80	50
3106	Cold	NS	FA	GA		23.5	0.20	50
WIRE AND CABLE TYPES								
1004	Hot	ST	FA	AL		23.5	0.45	50
1018	Hot	NS	FA	GA		23.5	0.08	—*
1019	Hot	NS	FA	GA		23.5	0.08	50
1503	Cold	NS	FA	GA		23.5	0.08	50
OIL-EXTENDED TYPES								
1703	Cold	NS	FA/RA	SA	N 25.0	23.5	0.75	60
1708	Cold	NS	FA	GA	N 37.5	23.5	0.25	56
1712	Cold	ST	FA/RA	SA	HA 37.5	23.5	0.75	55
1713	Cold	NS	FA/RA	GA	N 50.0	26.0	0.15	52
1714	Cold	ST	FA/RA	SA	HA 50.0	23.5	0.60	48
3153	Cold	NS	FA/RA	SA	N 25.0	23.5	0.75	42
3158	Cold	NS	FA	GA	N 37.5	23.5	0.25	42
3162	Cold	ST	FA/RA	SA	HA 37.5	23.5	0.75	42
3163	Cold	NS	FA/RA	GA	N 50.0	26.0	0.15	42
SPECIAL TYPES								
1009	Hot	NS	FA	SA		23.5	0.70	—†
1507	Cold	NS	FA/RA	SA		23.5	0.80	33
3015	Hot	NS	RA	SA		40.0	0.90	64
3100	Cold	NS	FA	GA		23.5	0.20	40
3105	Cold	NS	FA/RA	AL		23.5	0.50	33
3110	Cold	NS	FA/RA	AL		23.5	0.50	26
3115	Cold	NS	FA/RA	AL		40.0	0.60	33

Plus **FLOSBRENE**—The first commercially available **liquid** SBR and **CISDENE**—The new, improved-processing, stereo-specific high cis-polybutadiene rubber.

NS—Non-Staining **ST**—Staining **FA**—Fatty Acid **RA**—Rosin Acid **SA**—Salt Acid
GA—Glue Acid **AL**—Alum **N**—Naphthenic **HA**—Highly Aromatic
*—Cross-linked, Cpd. ML_4 125 †—Cross-linked, Cpd. ML_4 120

THE ASRC MANUAL... puts styrene-butadiene rubber facts at your fingertips. Available free on request to interested compounders.

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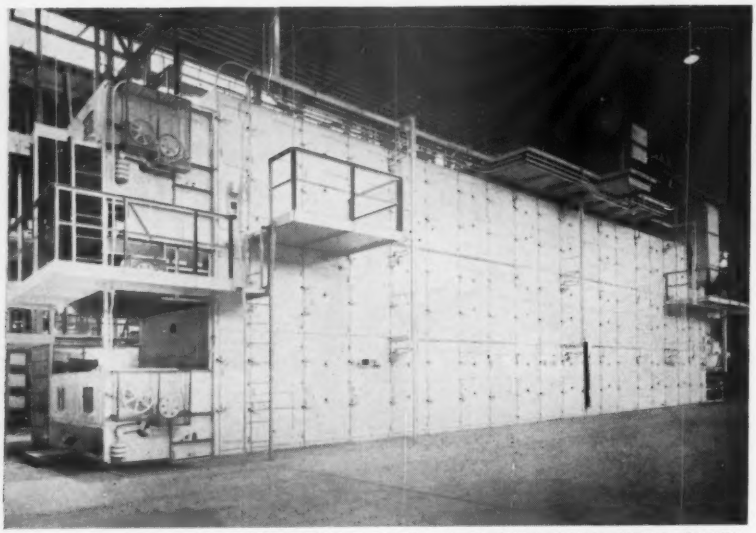

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by

SARGENT

MODERN FOR YEARS TO COME . . . here's completely automatic, high quality, high speed production with unprecedented safety and economy. Uniformly dried, uniformly cooled, uniformly CLEAN rubber crumb ready for baling is always dependably constant with a SARGENT. Performance is guaranteed.

Features developed by SARGENT over many years of designing and building rubber dryers include: Silicone spraying at the feed end to help prevent caking or rolling up of the crumb; Dryer sections zoned in groups with separate temperature and humidity controls; Highly efficient airlocks between dryer and cooler compartments; Breakers and brushes to assure a clean conveyor, and to reduce maintenance time and cost; Design that solved the dust problem . . . collectors are not needed at exhausts; A single housing for dryer and cooler . . . increases efficiency speeds the process cycle, lessens possibility of contamination of stock; Housing is covered with full size hinged doors and easily-removed panels for easiest possible cleanout, in least time; Every known safety device for protection of personnel, machine and stock; An exclusive precision pre-assembly method that guarantees the easiest, speediest, lowest cost installation of any dryer on the market. The SARGENT shown above, for example, is believed to be the largest of its type ever built. Yet it was erected at the customer's plant in less than four weeks. This recently installed 3-pass synthetic rubber dryer with cooler is gas-fired. Only 2 gas burners are needed to bring the huge dryer up to working temperature in less than ten minutes.

Gas burners, safety certified of course, may be mounted on top of the dryer section for more efficient operation, easier servicing. Heat source for SARGENT dryers may also be oil, steam or electricity.

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SARGENT experience and engineering can help you save time, money, man-hours in your drying process, producing a top quality, uniform quality product. Let us give you details.

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News in Brief

► E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has issued a brochure (Elastomers Notebook 99, April, 1961), entitled "Twenty Year Weatherability Test Results," which describes the results of an outdoor exposure test of neoprene vulcanizates.

► Underwriters' Laboratories, Inc., Chicago, Ill., has issued revised editions of "Standards for Safety for Rubber-Insulated Wires and Cables" (UL 44, Sixth Edition), and "Standards for Safety for Flexible Cord and Fixture Wire" (UL 62, Sixth Edition).

► Employees of the Elastomers Laboratory of E. I. du Pont de Nemours & Co., Inc., Chestnut Run, Del., have achieved a safety record of nearly 32 years without a time-losing injury on the job.

► Hercules Powder Co., Wilmington, Del., has introduced a new series of Hi-fax, high-density polyethylene resins for the production of one-gallon containers with rigid thin-walls.

► Foxboro Co. has opened a new 40,000 square foot assembly plant in East Bridgewater, Mass., for the manufacture and assembly of electronic consotrol instruments for process control systems.

► Miller-Stephenson Chemical Co., Inc. has opened a new office at 445 North Lake Shore Drive, Chicago, Ill., to serve as the mid-Western sales and warehouse headquarters for the company.

► A technical data sheet describing Retarded TCM-25, a non-toxic, inflammable retarder for natural and synthetic rubbers, is available from Wallace & Tiernan Inc., Belleville, N. J.

► Woburn Chemical Corp., Harrison, N. J., has appointed Gardner Chemicals, Inc., New York, N. Y., as its sales representative in the metropolitan New York and northern New Jersey area.

► A brochure entitled "Win with Delac-S," describing a free-flowing, dustless accelerator in Prill form, is available from Naugatuck Chemical, Naugatuck, Conn.

Quick answers to everyday problems on the major synthetic rubbers

SYNTHETIC RUBBER TECHNOLOGY

By W. S. Penn, B. Sc.

5½ x 8½ in. 326 pp. $8.50

Here, in Volume I of a two-volume series, is the first practical textbook devoted to the compounding and processing of the major synthetic rubbers . . . major from the standpoint that they are standard polymers whose techniques, although they will obviously change, will change more slowly than other synthetic rubbers not covered in the first volume. The newer materials will be covered in Volume II.

Elastomers covered in the current work include SBR, butyl rubber, neoprene, nitrile rubber, silicone rubber, Thiokol and high styrene resins. Modern and practical compounding techniques are given. Actual results are shown in the form of tables rather than the stylized results usually given in curves. Illustrations are not included since the book is not an elementary exposition of compounding and processing methods.

The author, Dr. Penn, is a graduate of London University and has spent all his working life in the rubber industry. He has specialized in synthetic rubbers, with many years experience in all branches of the industry. At present, he is Manager of the Synthetic Rubber and Plastics Division of Richard Klinger, Ltd., of England.

This book is a joint publication of Maclaren & Sons, Ltd., of London, England, and the Palmerton Publishing Co., Inc., of New York. Volume II, covering the newer synthetic rubbers, will be available within the next several months.

Partial Table of Contents

General Laboratory and Factory Practice

Choice of Polymer

Compounding and Processing of SBR

SBR in Tires and Other Products

Compounding and Processing of High Styrene Copolymers

Compounding and Processing of Butyl Rubber

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Compounding of Neoprene

Processing of Nitrile Rubbers

Fabrication of Silicone Rubber Products

Processing, Properties and Applications of Thiokol

Applications of High Styrene Copolymers

Special Properties of Nitrile Rubbers and Their Uses

Nomenclature of Various Polymers

Compounding of Special Neoprenes

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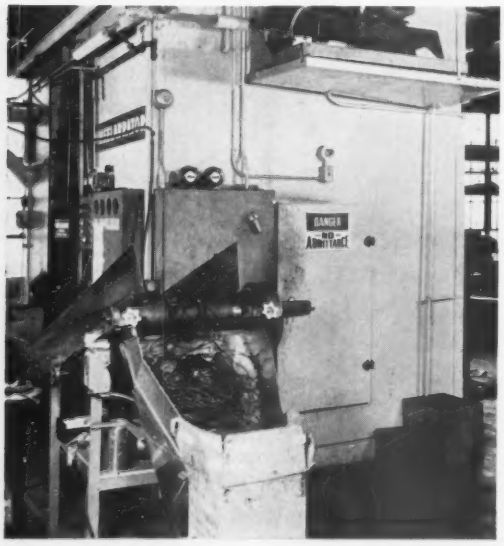
Labor cost savings averaging 60% have been achieved by one of the leading Midwestern rubber plants, deflashing precision mechanical rubber parts like these typical seals.

instantaneous deflashing with the new WHEELABRATOR® impact deflasher

Big parts, small parts, rubber parts with metal inserts—any precision molded mechanical rubber goods can now be deflashed almost instantaneously by the new Wheelabrator impact deflashing method.

Developed by Wheelabrator Corp. in cooperation with major rubber products manufacturers, the impact method has proven its cost-cutting effectiveness in actual working installations. It is so rapid that thorough deflashing is accomplished in from 3 to 5 minutes on as many as 10,000 parts at a time. Production rates from 20 to 300 times faster than methods previously considered to be the best obtainable are being achieved regularly.

Almost any type of molded rubber part can be impact-deflashed successfully where flash thickness is controlled. The expensive hand labor of buffing, tearing, scissors and knife trimming, and similar manual operations are completely eliminated.



PERFORMANCE PROVES THE SAVINGS OF WHEELABRATOR RUBBER DEFLASHING

At a prominent Chicago rubber molding plant one Wheelabrator rubber deflashing cabinet has replaced 10 workers who formerly hand finished O-rings and other molded products.

Man-hours required for finishing 2" to 16" I.D. O-rings, with sectional diameters less than a quarter-inch, have been reduced by 87% to 97%. On other molded parts having irregular shapes, hand labor has been reduced from 36% to 86%, with an average labor saving of approximately 60%.

The finish obtained, and the thoroughness of the deflashing operation, is superior to that formerly obtained by hand methods. Precision parts with thin cross sections, parts too fragile for conventional CO_2 tumbling, and parts too complex for efficient hand trimming, are now being deflashed at tremendous savings.

A REVOLUTIONARY NEW PROCESS FOR RUBBER PARTS PRODUCERS

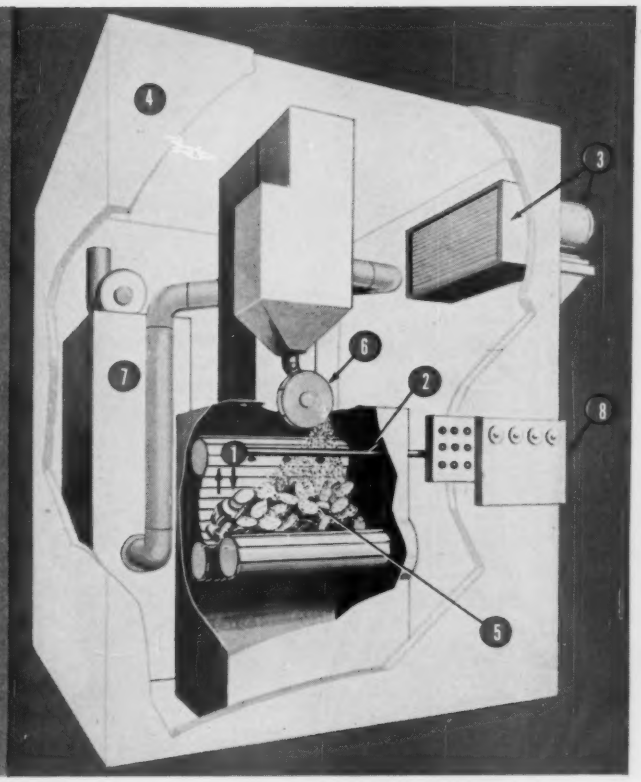
The Wheelabrator impact deflashing method takes the hand work out of deflashing, mechanically removes the flash from large quantities of parts in cycles of only 3 to 5 minutes.

Parts are first loaded onto a moving endless belt conveyor within the 2 cu. ft. work chamber, (1) which handles hundreds to thousands of parts in one batch.

Liquid CO_2 from a low pressure system is sprayed through nozzles to freeze the flash, without freezing the parts themselves (2) An auxiliary refrigeration system (3) keeps the enclosure at a low temperature. With the accurate controls provided, CO_2 gas consumption averages less than 5 lbs. per load. A fully insulated enclosure (4) houses all operating equipment.

With flash frozen, the parts are gently turned over continuously within the blast of the deflashing media (5) exposing all areas of the parts to the deflashing blast.

An 8-bladed wheel (6), utilizing centrifugal force, hurls deflashing media in a controlled pattern on the parts. The impact of these particles trims the frozen flash, without damage to the resilient, unfrozen parts. The media is continuously recycled and cleaned, while a closed-cycle dust collecting system (7) ventilates the entire operation. All operations are automatically timed and sequenced from a convenient control panel (8).



LET US PROVE THE SAVINGS YOU CAN MAKE

Arrangements can be made for you to attend an actual demonstration of the process on your molded parts in our laboratory. Here you will see the tremendous saving potential and exact processing cycles on an actual production machine. Naturally, there is no obligation to you. For detailed information write today or return the convenient coupon below to WHEELABRATOR CORPORATION, 649 S. Byrkit Street, Mishawaka, Indiana. In Canada, WHEELABRATOR CORP. OF CANADA, LTD., P.O. Box 490, Scarborough, Ontario.

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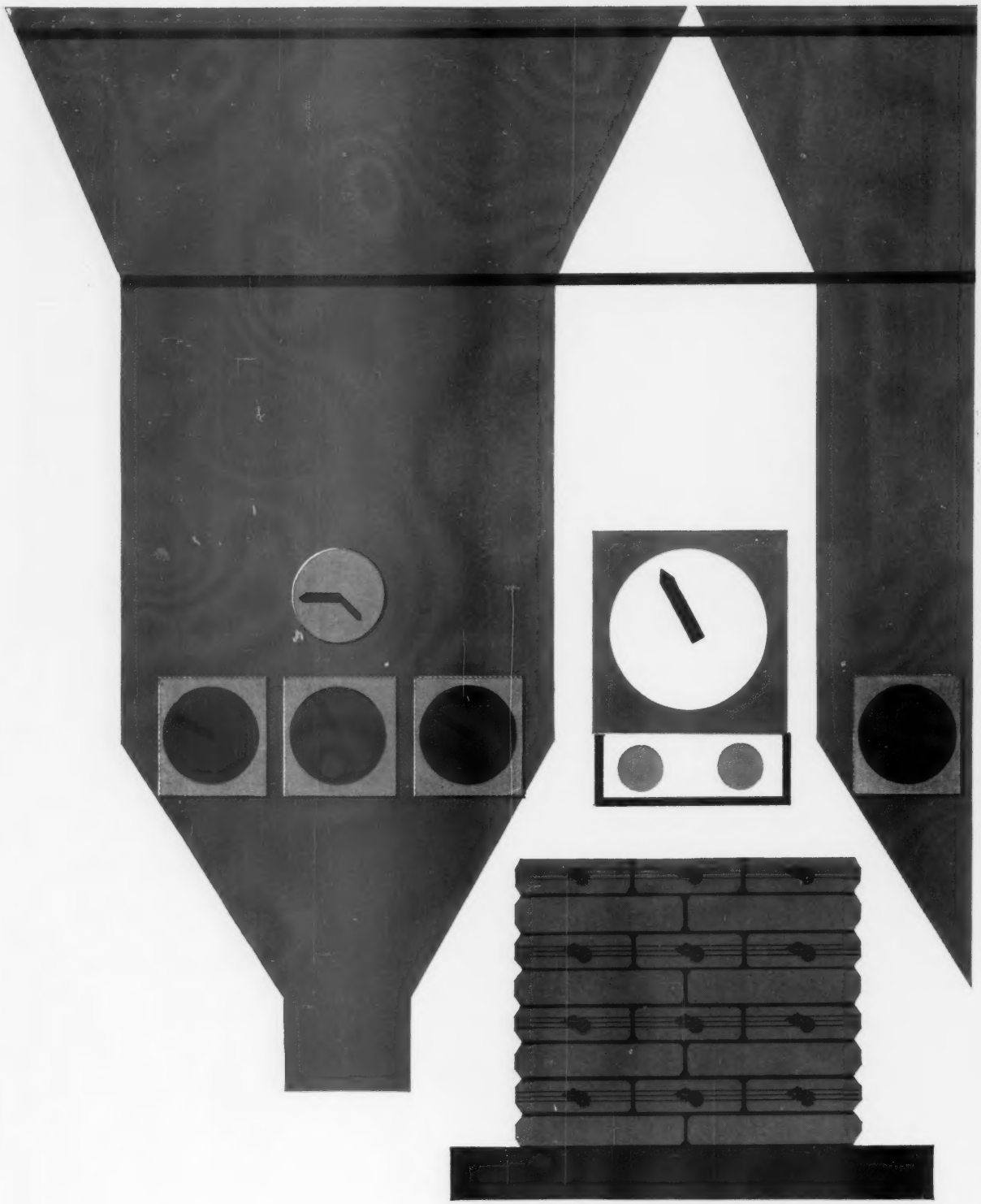

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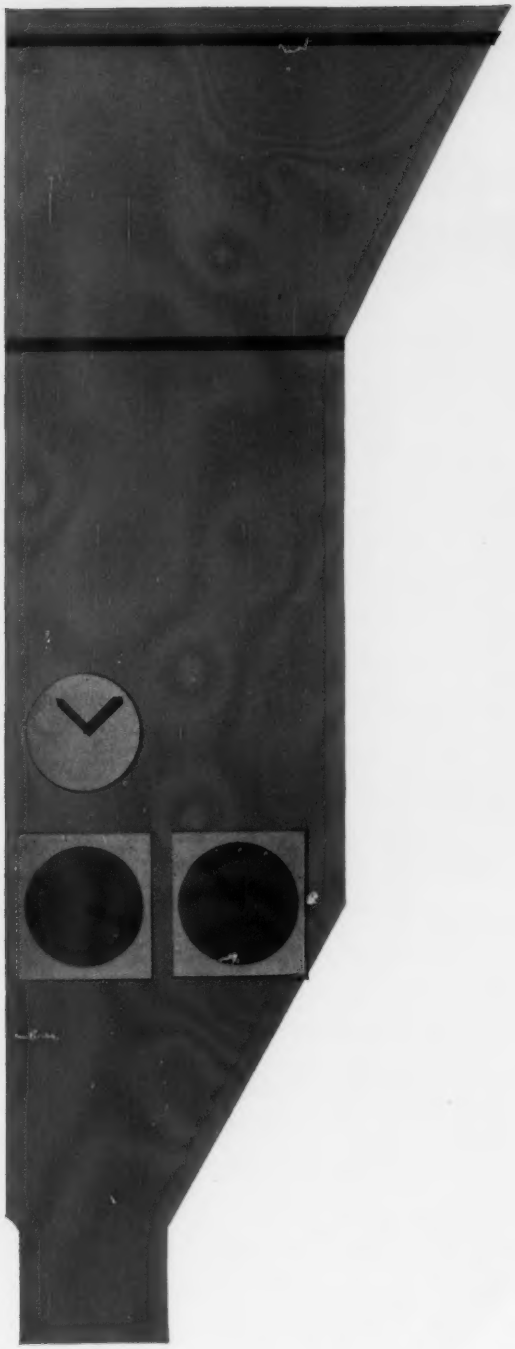

CARBON BLACK HOW YOU WANT IT

Continuous production in the industry's most heavily instrumented plants means you get carbon black of consistent quality when you order it from Witco-Continental. You get a product with the physical properties you want, shipped the way you want it.

You also get the benefits of Witco-Continental's "Unified Control" system. Your orders and requests are channeled through one integrated world organization to provide the full benefits of Witco-Continental production and research facilities ...fast, smooth service from the time your order is received, right through packaging and shipment.

Witco-Continental has increased its capacity by fifty per cent—another assurance of getting your carbon black how, when and wherever you need it.

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Now you can greatly increase warehouse space at no increase in cost with... AZODOX high apparent density zinc oxides

- Easier to Handle
- Stacks Higher, Safely
- Less Bag Breakage
- Close-Packed, Unitized Shipments

AZODOX stores in much less space than other zinc oxides. That's because you get many more pounds of AZODOX per cubic foot of pigment—up to 62 lbs. per cubic foot! Save valuable space for other purposes with every ton of AZODOX you buy.

In the manufacture of AZODOX, an exclusive process removes excess, space-wasting air from between individual particles of zinc oxide. Actual pigment density and every other desirable property remain unchanged. High apparent density AZODOX flows freely yet dusts less, incorporates fast and disperses thoroughly.

AZODOX is available in the following grades at no additional cost over conventional zinc oxides:

	Bulk Density lbs./cu. ft.	Rate of Activation	Reinforcement Properties
AZODOX-44 (Conventional)	60	Medium	High
AZODOX-55 (Conventional)	60	Fast	High
AZODOX-55-TT (Surface Treated)	62	Fast	High
AZODOX-550 (Conventional)	58	Medium	High

For technical data, fill in and mail this coupon.

AMERICAN ZINC SALES COMPANY
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Please send me technical information about...

☐ AZODOX-44 ☐ AZODOX-55-TT
☐ AZODOX-55 ☐ AZODOX-550
☐ 15 types of AZO brand zinc oxides

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ROSS
Air Systems

Engineered Atmospheres for Better Processing

This refers to a foam rubber processing installation . . . a 65 foot long by 8 foot wide Ross Continuous Dryer and Curing Unit for drying C-Foam mattresses, furniture and aircraft cushions at the American Latex Corp. plant, Hawthorne, California.

Twenty minutes of the 45 minutes total continuous processing time are critically important because it is the curing period. Here is where the carefully conceived and controlled 'Engineered Atmosphere' comes into the picture. The temperature in this zone has to be held very close to 240°F by specially designed introduction, circulation and exhausting of hot air. Timing of travel has to be just right.

20 critical minutes at 240°F

Approaching the discharge end comes a complete reversal . . . a cooling zone, where residual hot spots, which could cause spontaneous combustion of the material in storage, are eliminated by the controlled introduction and circulation of cool air.

In this installation, there are at least four important elements of an 'Engineered Atmosphere' : zoning, circulation of hot air, temperature control and cooling . . . all precision problems. Drying, curing, baking, impingement, heating, cooling . . . these are typical of the operations on which Ross Engineers have concentrated their skills for more than forty years.

Send for your copy of Bulletin S-5

J. O. ROSS

J. O. ROSS ENGINEERING/a division of Midland-Ross Corporation
730 Third Avenue, New York 17, New York
ATLANTA • BOSTON • DETROIT • LOS ANGELES • SEATTLE • MT. PROSPECT, ILL. • MOBILE

M-R

A utility ballplayer is never known as a great second baseman or a superior tackle. He only achieves true recognition from his manager and other ballplayers. When a crisis arises, he has the chance to be a star. It is not very often that we can transfer such an analogy to a raw material. However, GPF carbon black is definitely in this category. It wasn't developed for a specific end use. Carrying the ballplayer analogy a step further—we can say that the comparable term to a "ballplayer's ballplayer" is that GPF could be called the "compounder's carbon black." It is good for a variety of uses and allows the ingenuity and creativeness of a compounder to produce a variety of black combinations.

Today we may be experiencing the beginning of a new phase in GPF usage. Compounding costs are on the rise and GPF can replace many long standing carbon black combinations. This may then be the catalyst or crisis which will cause GPF to assume a new stature.

CARL SNOW
Manager, Field Technical Service
United Carbon Company, Inc.

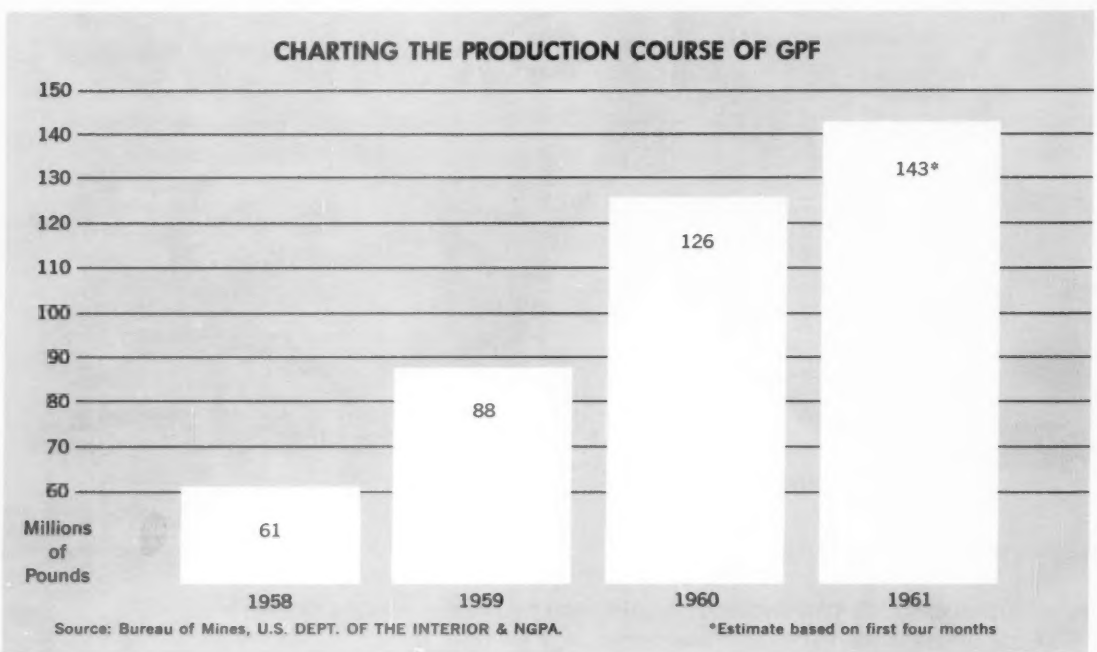
A Product in Perspective

GPF Carbon Black

GPF carbon black or General Purpose Furnace Black produced by the furnace process from an oil or oil and gas base is quite distinct from any of the carbon blacks that have been reviewed to date. Actually GPF was designed to be a combination of several advantages of the then known furnace carbon blacks. It would be in order at this point to quickly review the attributes of two major furnace blacks produced prior to the advent of GPF.

The Regulars

SRF carbon black or semi-reinforcing black represented a breakthrough. It was a breakthrough from a productivity standpoint when compared with channel black. "A highly increased yield of good quality black from a given amount of hydrocarbons" was the stated purpose of an early patent covering SRF, the first black produced by the continuous furnace process.



SRF today is still unmatched as an economical, high-loading and strengthening agent for rubber stocks. From a process standpoint, SRF carbon blacks mix coolly and easily with rubber stock even at high loadings. This carbon black has found use in every type of man-made rubber.

FEF or Fast Extrusion Furnace Black was developed for a single purpose and its name spells it out. It is unique and unequalled today as a processing aid, primarily because it is a high structure black. In fact, it has a higher degree of structure than is present in any conventional grade of rubber black. It is because of this structure that FEF assists in speeding up extrusion and retaining gauge by reducing uncured stock nerve. It also imparts excellent smoothness to tubed and calendered stocks. Basically, wherever processing characteristics are the premium requirement, FEF is a natural choice.

Each of these materials found areas where they were a star. The economical SRF provides a high loading and some degree of reinforcement. FEF is the outstanding processing aid. Furthermore, its unique properties assure truer dimensions and improved appearance in end products.

The Compounder's Carbon Black

The rubber chemist and compounder know the ability of each of the regular furnace blacks very well. They have found that in a considerable number of their formulations it was expedient to combine two, three or more carbon blacks to achieve either the economy, the surface appearance, the processibility or the reinforcement a particular application required.

Actually, there was a definite area in between SRF and FEF for the development of a carbon black which combined some of the better properties of each and which could be used as a replacement of various black combinations. GPF filled this void.

When GPF was originally developed, it received considerable attention. However, the true potential of this material has never been fully realized. To illustrate the ability of this product to replace other blacks and maintain the same property values, we have chosen a carbon black combination in two carcass compounds and matched these with GPF compounds. Test data has been run on these combinations and would seem to support the use of GPF as a replacement for these various combinations.

GPF In Action

Many medium and high quality carcass compounds contain combinations of FEF and SRF blacks. Two such compounds and their GPF counterparts are presented here:

	Good Quality Carcass Stock		Prime Quality Carcass Stock	
Compound	A	B	C	D
Natural Rubber	40	40	90	90
SBR 1500	40	40	10	10
Reclaim	40	40		
FEF	20		15	
SRF	10		10	
GPF		32.5		27.5

The ability to load an increased quantity of GPF in the compound will mean a lower volume cost. Each compounder can calculate the savings possible, based on his total ingredients and compounding costs. As this varies considerably from plant to plant, no specific cost comparisons are offered here.

After suitable preparation, the compounds indicated above were cured 45 minutes at 287°F. The following test results were obtained:

	Good Quality Carcass Stock		Prime Quality Carcass Stock	
Compound	A	B	C	D
300% Modulus	1600	1510	1130	1080
Tensile	2660	2600	3930	4060
Elongation	440	455	565	600
Durometer (Shore A)	60	60	53	53
Compound Viscosity ML-4 @ 212°F	39	38	45	42
IMS @ 260°F	23′	23′	24′	23′
Heat Build-Up, °F	38	38	19	20

Industrial Product Compounds

Many industrial product recipes originally developed for a specific product, have been adjusted again and again for other end uses. One such recipe finally contained a total of 107 parts of MPC, FEF, SRF and MT. On a direct replacement basis, 107 parts of GPF resulted in a better product and substantial savings.

This direct replacement of a combination of blacks with GPF is unique. It is realized that the normal evaluation procedure calls for comparisons at such equal loadings. However, this may not reveal the true value of GPF.

Examining the point further, it can be noted that industrial products usually call for a specific hardness level as a primary value. GPF will impart a lower hardness level to a compound than FEF when tested at equal loadings. Thus, the loading of GPF should be higher than FEF for a comparison at equal hardness.

When an equal hardness level is attained, GPF will show equal modulus, slightly lower tensile strength and slightly poorer extrusion characteristics. Such small differences can often be acceptable where economy is a prime factor.

Significant Advantages

A review of the three significant reasons for using carbon black in rubber is in order. These are, we believe, the simplest parameters available to review a particular black in comparative terms. Briefly, they are as follows:

1. Reinforcement (wear and service life)
2. Filler (economy)
3. Process aid (mixing and fabrication)

In comparative terms, GPF is unmatched in its extreme versatility of application. It offers an unusual combination of high modulus, resilience, smooth extrusion, adequate reinforcement and economy. It approaches the loading capacity of SRF and retains low hysteresis properties. On the other hand, its particle size and structure characteristics induce smoother processing and low die swell approaching that of FEF.

GPF can be used in combination with other furnace blacks as well as the channel carbon blacks.

It possesses the lowest heat built-up in combination with satisfactory viscosity, high rebound, low abrasion, high tensile strength and hot tear resistance. It has been used in tire body stocks, breaker cushions, and sidewall compounds, as well as in a variety of mechanical rubber goods applications. It offers the necessary structural reinforcement for reduced-ply tires.

A rebirth of enthusiasm for GPF seems to be kindling as the cost of inventorying and compounding multiple blacks increases. Valuable hours of the chemist or compounder are required to provide adequate supervision for plant personnel cutting into needed time for quality control and general management. When the time of key personnel is stretched too tight and basic compounding costs spiral upward, the ability of a black to replace such combinations becomes even more important.

PROPERTIES OF GPF IN REVIEW

PROPERTIES	UNITS	SRF	GPF	FEF
Surface Area	Sq. M/Gm.	19.5	31.8	39.0
Particle Dia.	Mu	160.0	98.3	80.0
Volatile Matter	%	0.74	0.07	0.91
Ash	%	0.4	0.47	0.11
pH	—	9.9	9.9	9.3
Iodine Number	Mg./Gm.	21.1	33.0	47.0
Tint Comparison	—	240.0	285.0	308.0

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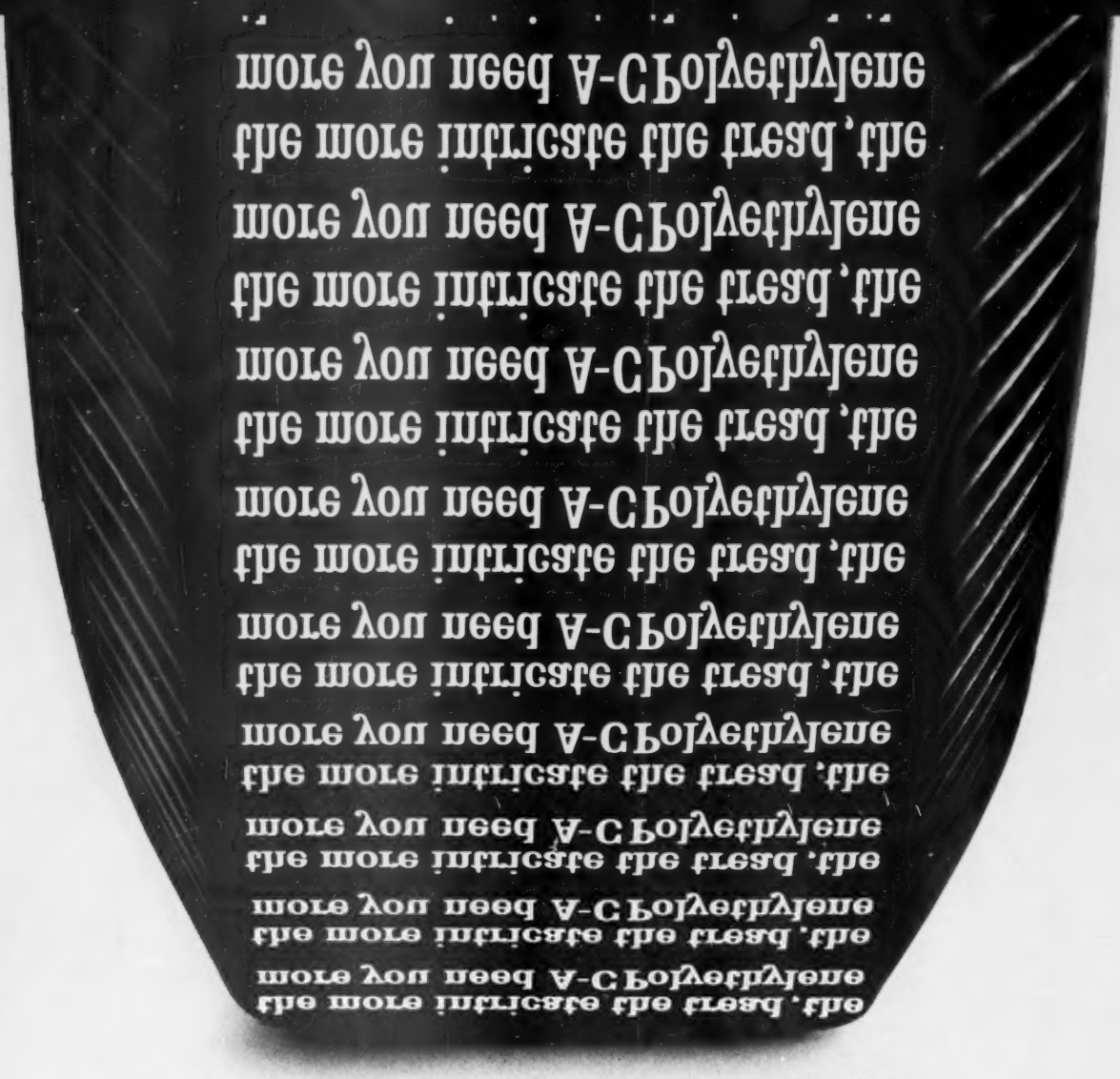

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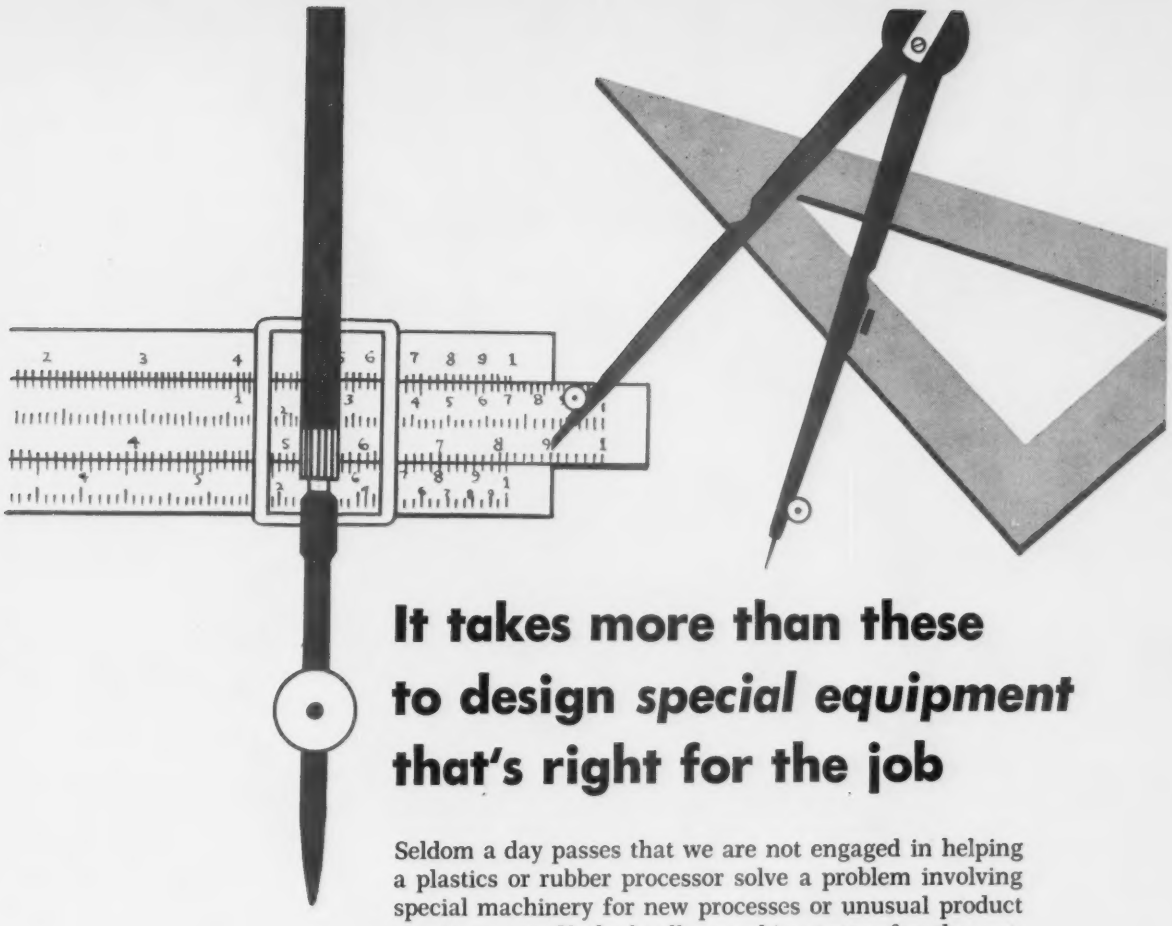

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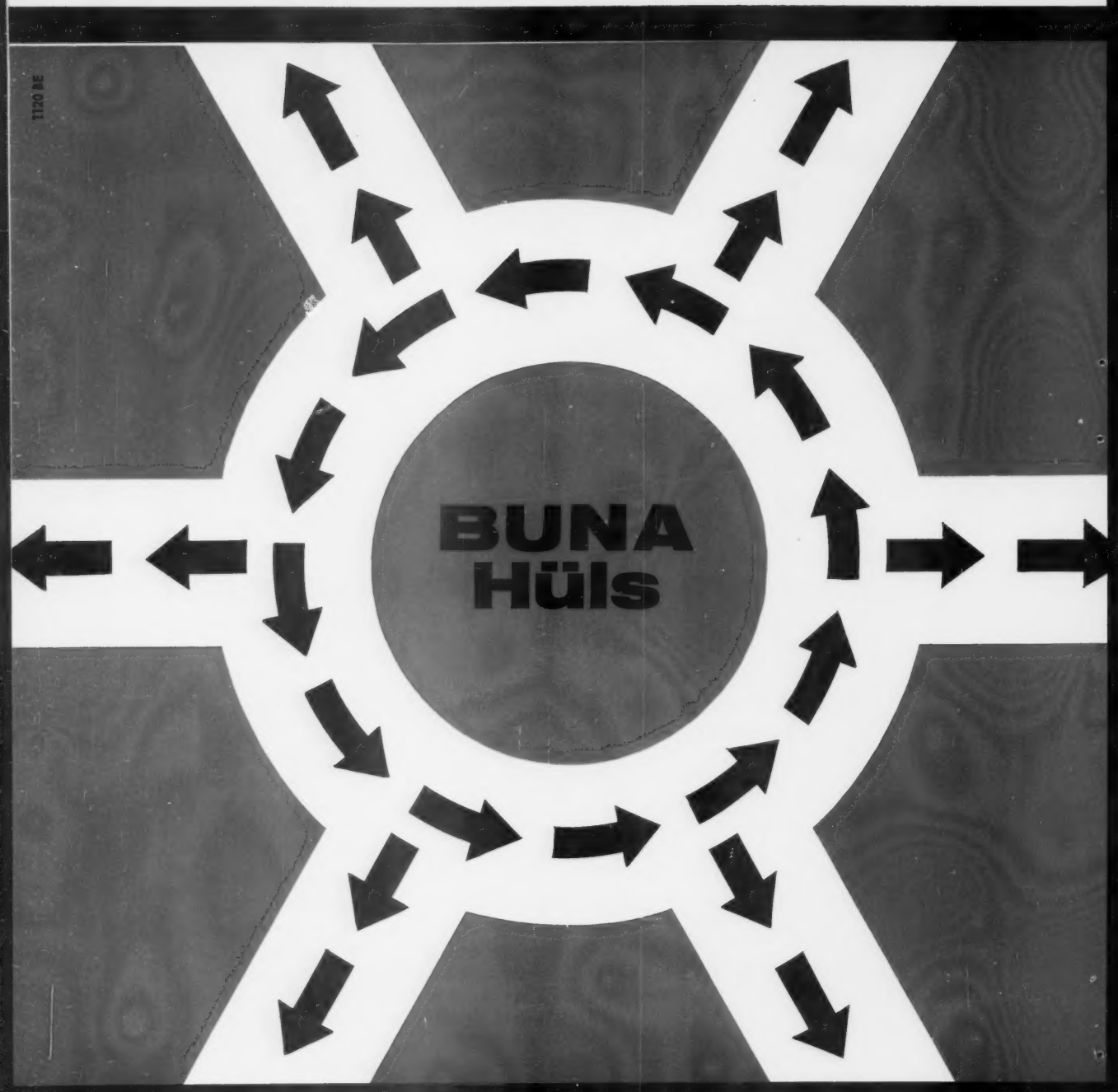

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STANDARD GRADES

BUNA Hüls 150
HS, staining
General purpose type, specially suited for manufacture of tyres, conveyor belting, high quality shoe soles, technical mouldings and special items.

BUNA Hüls 152
HS, non-staining
General purpose type for the manufacture of light coloured rubber goods and high quality shoe soles.

BUNA Hüls 153
HS/FS, non-staining
Specially developed for the production of very light coloured and transparent rubber goods and cable insulation.

BUNA Hüls 302
HS, staining, with 37.5 parts oil
Recommended for tyres, retreading, technical mouldings.

BUNA Hüls 362
HS/FS, non-staining, with 37.5 parts oil
Light coloured and transparent grade with good processing characteristics on roll mill and calender; reduced tackiness during processing.

BUNA Hüls 372
HS, non-staining, with 37.5 parts oil
Excellent properties, specially suited for production of light coloured and transparent articles, white walled tyres.

BUNA Hüls 373
HS, non-staining, with 50 parts oil
For the economical production of moulded rubber goods of all types; raw material cost reduced.

SPECIAL GRADES

BUNA Hüls BT 13
HS/FS, equivalent to BUNA Hüls 373

BUNA Hüls BT 21
HS/FS, equivalent to BUNA Hüls 302
The advantage of these two grades is that there is reduced tackiness when processing raw mixes on roll mills.

Types with high Mooney values

BUNA Hüls BT 4
HS, staining; Mooney viscosity (ML_4) approx. 120

BUNA Hüls BT 22
HS/FS, equivalent to BT 4
These grades are especially suitable for the production of heat resistant articles, e. g. high pressure gasketing, brake and clutch linings as well as for flame resistant rubber mixes with high chlorparaffin content; extremely low compression set in the case of grade BT 12; processability of BT 15 better than that of BT 12.

BUNA Hüls BT 12
HS, non-staining, Mooney viscosity (ML_4) approx. 150

BUNA Hüls BT 15
HS, non-staining, Mooney viscosity (ML_4) approx. 130

Types with low Mooney values

BUNA Hüls BT 16
HS/FS, non-staining, Mooney viscosity (ML_4) approx. 40

BUNA Hüls BT 17
HS/FS, non-staining, Mooney viscosity (ML_4) approx. 30
These grades are distinguished by the ease with which they take up fillers, better calendering properties and less shrinkage. Designed for the production of soft, easy flow rubber mixes (e.g. for rubber soles made by moulding direct to uppers); also for sponge rubber.

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BUNA Hüls 200
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BUNA Hüls 220
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HS: rosin acid, FS: fatty acid

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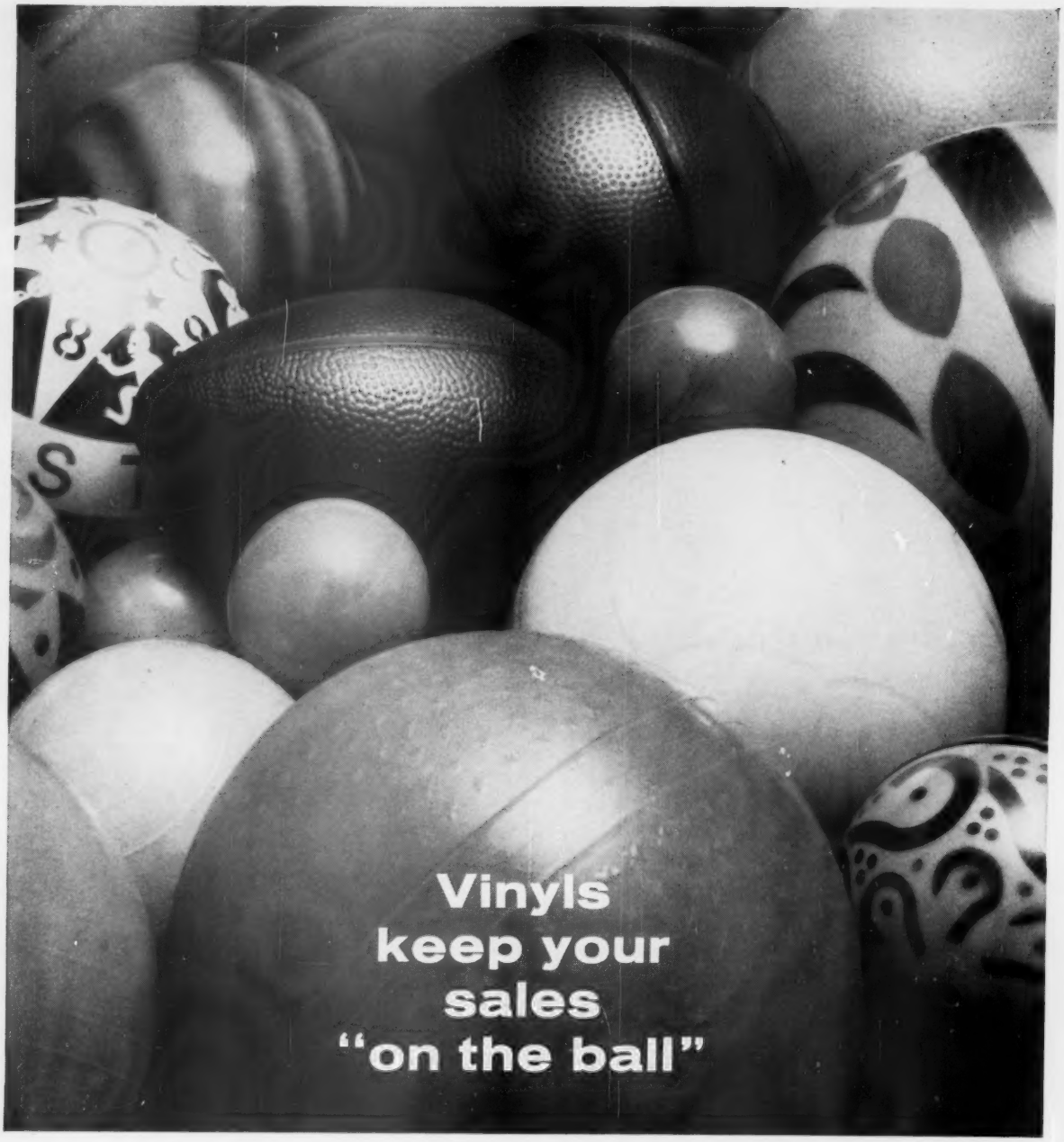

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• **East Germany Plans Rubber Production.** The East German trade paper, *Plaste und Kautschuk*, reveals some details in its March issue concerning the communist schedule for the rubber industry. It states that a very important task for the rubber industry is the weeding out of a multitude of duplicated items from the production programs of individual factories. Much has been accomplished so far, but a number of eliminations of types and sizes has yet to be put into effect. During 1960, a simplification of the program was arranged. Henceforth, tires for motor bikes will be manufactured only in the Reifenwerk Heidenau. Automobile tires will be produced only in the Reifenwerk Riesa. Truck tires and tires for tractors will be manufactured in the Reifenwerk Fuerstenwalde.

Rubber shoes, which heretofore have been manufactured by Tabarz, an affiliate of the rubber combine, Thuringia, have been switched to the rubber installation "John Schehr" in Schoenebeck.

Research and development activities in 1960 have shown some results. Medium-sized rubber containers for the transportation of liquids and powders have been developed, and production of these containers was started in 1961. Concerning the development of a rubber auxiliary filler, K 60, the article continues, it was possible to reach the level of world production (this probably means that the quality has been improved to the extent that the product can now compete with similar products produced in the free world) and therefore it will be possible to improve the quality of certain rubber articles.

Because of the fact that it was impossible to construct enough buildings and to produce enough machinery (a chief example is the Erste Machinenfabrik Karl-Marx-Stadt, which failed to fulfill its contract commitments), the planned investments and expansion of the rubber industry could not be fully realized. The individual factories have done their best to increase production, however, and it should be noted that Reifenwerk Fuerstenwalde could increase its annual capacity to 90,000 truck tires. In contrast, a West German factory recently reached a *daily* production rate of 23,000 tires.

• **Clear Reinforcing Fillers.** Our French contemporary, *Revue Generale du Caoutchouc*, recently published a thorough analysis of this subject by R. Ecker. The author states that by incorporating clear reinforcing fillers it is possible to obtain almost equal physical properties to those obtained with carbon black. In some essential points, however, properties of the vulcanizates with silica fillers are still unsatisfactory; these points being abrasion resistance and the high degree of permanent elongation and compression set. Mixing temperature is apparently of considerable importance in the utilization of silica fillers. Further improvement can be brought about by a tempering process between batch production and compounding, owing to a change in the filler/rubber gel complex. But, in laboratory tests, it was only the use of suitable promoters in conjunction with the tempering process which produced abrasion values equal to those of highly active carbon black, both for vulcanizates of natural rubber and for those of butadiene-styrene. A reduction of the permanent set and an increase in the modulus values could also be observed.

• **Italian Rubber Production.** In 1960, 54.8 per cent of the Italian rubber industry was devoted to the production of automobile tires; 110,707 tons were manufactured. Only 3.4 per cent of the industry was devoted to producing bicycle tires; during 1960, 6,821 tons were manufactured. For the recapping of tires, a considerable quantity of camelback was required; 7.7 per cent of Italian camelback capacity was devoted to the production of 15,492 tons of recapped tires.

A large quantity of technical rubber articles was manufactured; 26.9 per cent of total capacity was used to produce 54,460 tons. Output of sanitary rubber articles totalled 1,414 tons, equal to 0.7 per cent of total capacity. Rubber shoes (8,516 tons), and rubber soles, solvents and chemicals, (4,677 tons), constitute the balance of Italian rubber production, which totalled 202,087 tons. About 60 per cent was synthetic rubber, and 40 per cent was natural rubber.

• **Italian Pirelli Cuts Tire Prices.** The leading Italian tire company, Pirelli S.p.A., has reduced the list prices of its automobile tires by four per cent and has decreased its truck tire prices by three per cent. Due to a considerable increase in production and more efficient production methods, it was possible to effect substantial savings, part of which will benefit the consumer. In 1960, the Italian tire industry produced 110,000 tons of automobile tires; from January 1 to April 30, 1961, about 9,700 tons of automobile tires were exported.

• **German Rubber Market Broadens.** The Phoenix Gummiwerke AG Hamburg - Harburg reports increased sales totalling 290 million DM ($72.2 million), the result of the increasing demands of the domestic market; a satisfactory volume of export sales has also been processed. All establishments worked at full capacity last year, and the number of orders which will have been processed in 1961 justifies anticipation of a very large dollar volume. Management points out, however, that the ever-increasing cost of raw materials and higher expenditures for wages and salaries, combined with a shortened work-week, make it quite difficult to achieve this anticipated volume. Domestic sales have been hampered lately by increasing competition from various foreign countries, particularly those with a lower wage level; the volume of exports has been influenced by the devaluation of the German Mark and also by stiffer competition. In view of the ever-increasing importance of the French market, the company has bought a large interest in a French factory. A dividend of 14 per cent will be paid to the shareholders.

The Continental Gummiwerke AG Hannover was also able to report increased domestic and export sales in the first half of 1960. The company has been very successful with its new automobile tire, which has opened up a new market; the great demand for various sizes has made it difficult to satisfy the requests of all customers. In view of the shortage of labor, it will be quite difficult to increase production, and sales will consequently remain more or less at the same level. However, the company was able to increase its sales from 75 million dollars in 1950 to 220 million dollars in 1960. Of this amount, 15.4 per cent constituted export sales.

In view of the ever-increasing importance of the plastics field, the company has bought a small factory in Babenhausen which produces an excellent selection of plastic items. Several rubber products manufactured by Continental Gummiwerke have been replaced by plastic items—for example, rubber tiles by plastic tiles. Management has proposed the payment of a dividend of 16 per cent, and this has been accepted by the shareholders.

The New York-Hamburger Gummiwaren Compagnie, Hamburg-Harburg, was able to increase its sales last year by 30 per cent, reaching approximately six million dollars. Management points out that the excellent results were possible only because, in previous years, large sums had been invested in new machinery and in modernization of the entire manufacturing process. The company has been working at full capacity and has exported about 20 per cent of its production. Prices have been more or less stable, in spite of the fact that a considerable number of raw materials has risen during the past year. A dividend of 12 per cent has been declared, compared with 10 per cent last year.

• **Continental Gummiwerke Building New Plant.** Continental Gummiwerke, Hannover, has obtained long-term credits of $250,000 to build a new factory. In order to stimulate the industrialization of zones located along the East German border, the West German Government has appropriated long-term credits amounting to 1.8 million German Marks ($450,000) for Lower Saxony. The major share of this long-term credit, one million German Marks ($250,000), has been given to Continental in order to build a factory at Dannenberg, near Lueneburg.

• **German Cars Equipped with Tubeless Tires.** Because the Germans have had very little experience with this kind of tire, some of them, it seems, have tried to increase safety margins by inserting a tube in their tubeless tires. The Phoenix Gummiwerke have made a number of tests, and have recently published a warning indicating that the use of a tube in a tubeless tire is not an increased safety factor, but just the opposite: it might create premature defects and blowouts.

• **German Rubber Industry Booming.** In 1960, the German rubber industry was able to establish a new record, reporting total sales of approximately $905,000,000. Compared with 1959, sales rose by about 15 per cent. Domestic consumers bought merchandise amounting to approximately $700,000,000; export sales totaled approximately $200,000,000. The leading export item, automobile tires, amounted to approximately $50,000,000.

• **German Synthetic Rubber Processing Increases.** In 1960, the German rubber industry processed 218,000 tons of rubber, using about 44.4 per cent, equal to 96,000 tons, of synthetic rubber. In 1959, only 65,000 tons were processed, whereas the amount of natural rubber decreased from 128,000 tons in 1959 to 121,654 tons in 1960. The Continental Gummiwerke AG in Hannover was able to boost its share of synthetic rubber to 47.9 per cent of its total consumption.

• **Russia Buys Italian Tire Equipment.** According to the April issue of our Italian contemporary, *Notizie per l'Industria Della Gomma,* machines and equipment for the production of tires have been purchased by the Soviet Union's import agency, Techmes, from the Italian concern, Pirelli S.p.A.

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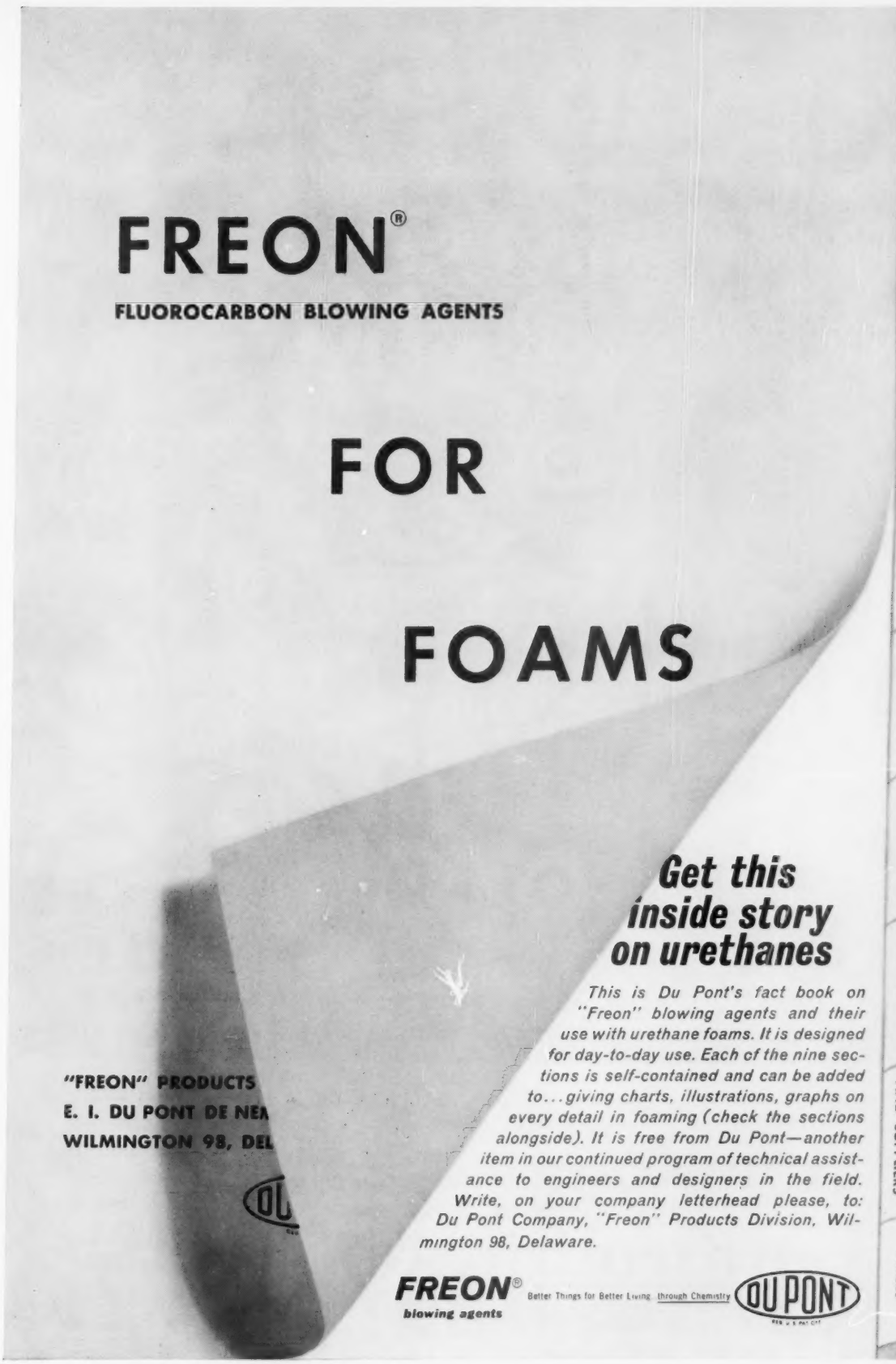

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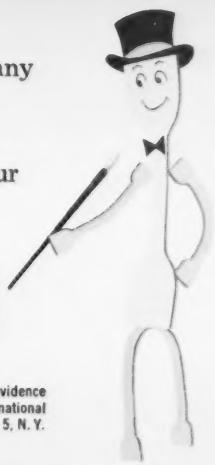

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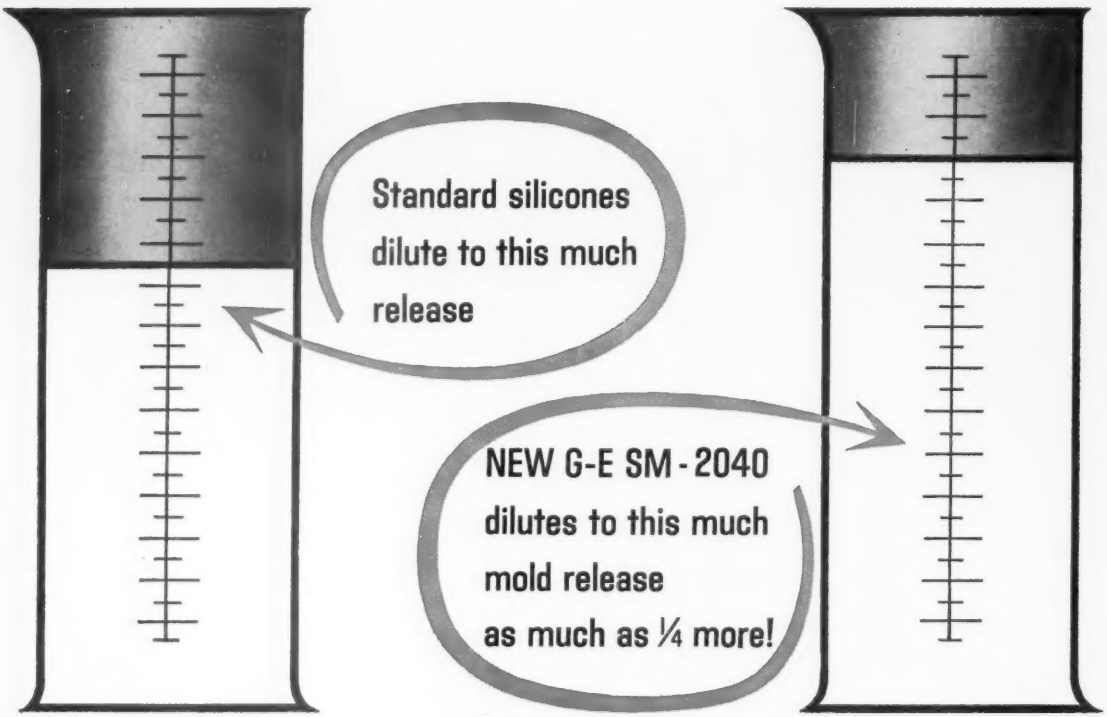

New General Electric SM-2040 silicone emulsion gives easier release, cleaner molds, drier, brighter surface . . . at cost savings up to 25 percent

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SM-2040 is now available from the General Electric Silicone Products Dept. or the Harwick Standard Chemical Company.

For additional information and a free test sample, write General Electric Company, Silicone Products Dept., Section HH950, Waterford, N. Y.

If you now dilute a gallon of conventional silicone emulsion with this much water:	Mold spray cost/gallon	You can dilute a gallon of G-E SM-2040 with this much water:	Mold spray cost/gallon
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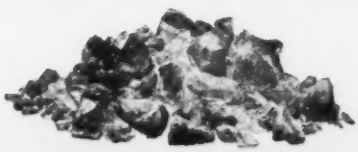

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1. SBR for all applications. Shown above is a hot, nonpigmented, nonstaining polymer ready for shipment. Shell Chemical also makes cold polymers, black masterbatches, oil-extended polymers, oil-black and resin-rubber masterbatches.

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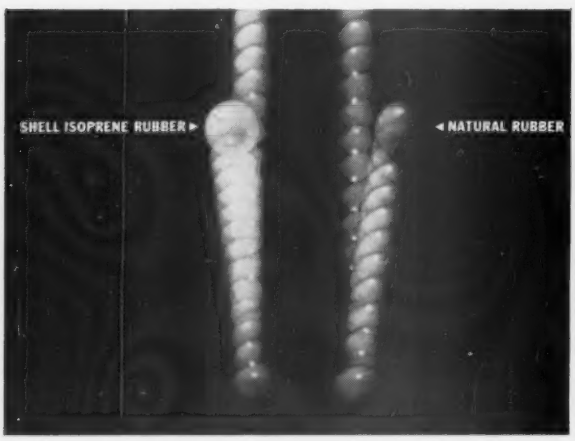

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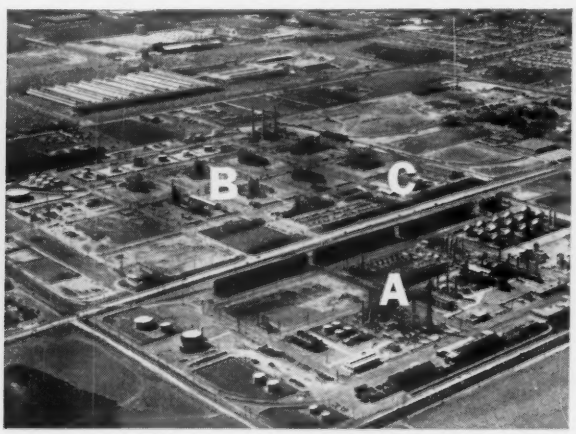
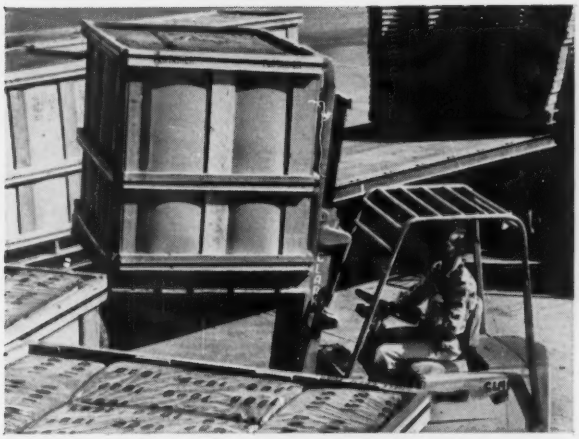


4. Shell's Torrance plant. This Shell Chemical plant, in Torrance, California, is the only fully integrated SBR plant in the United States. Here, Shell makes butadiene, (A), styrene, (B), and polymerizes these, (C), into copolymers.



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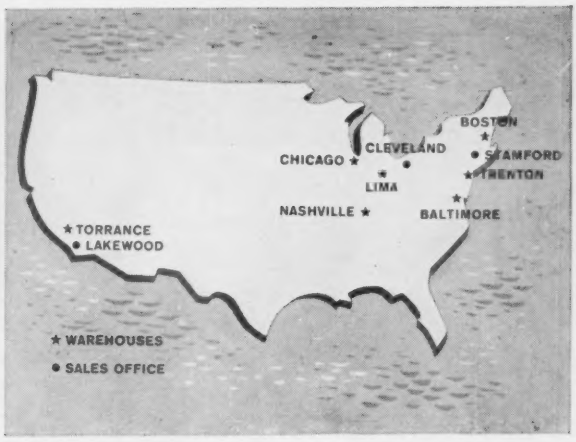

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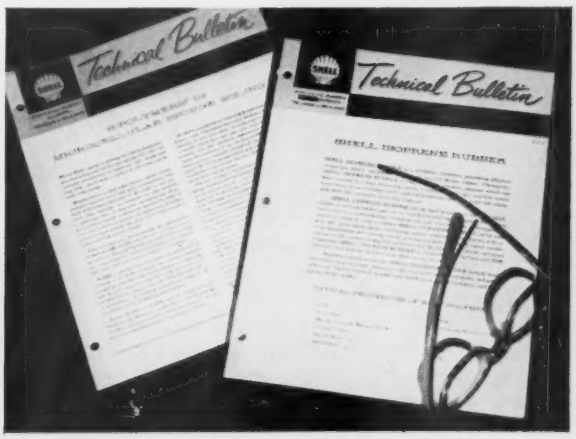
7. Shell's Technical Service constantly seeks new ways to use rubber more effectively and profitably. In our photo, a chemist completes a mold-on sole. Work like this pays off in new polymers and processing methods for hundreds of items.



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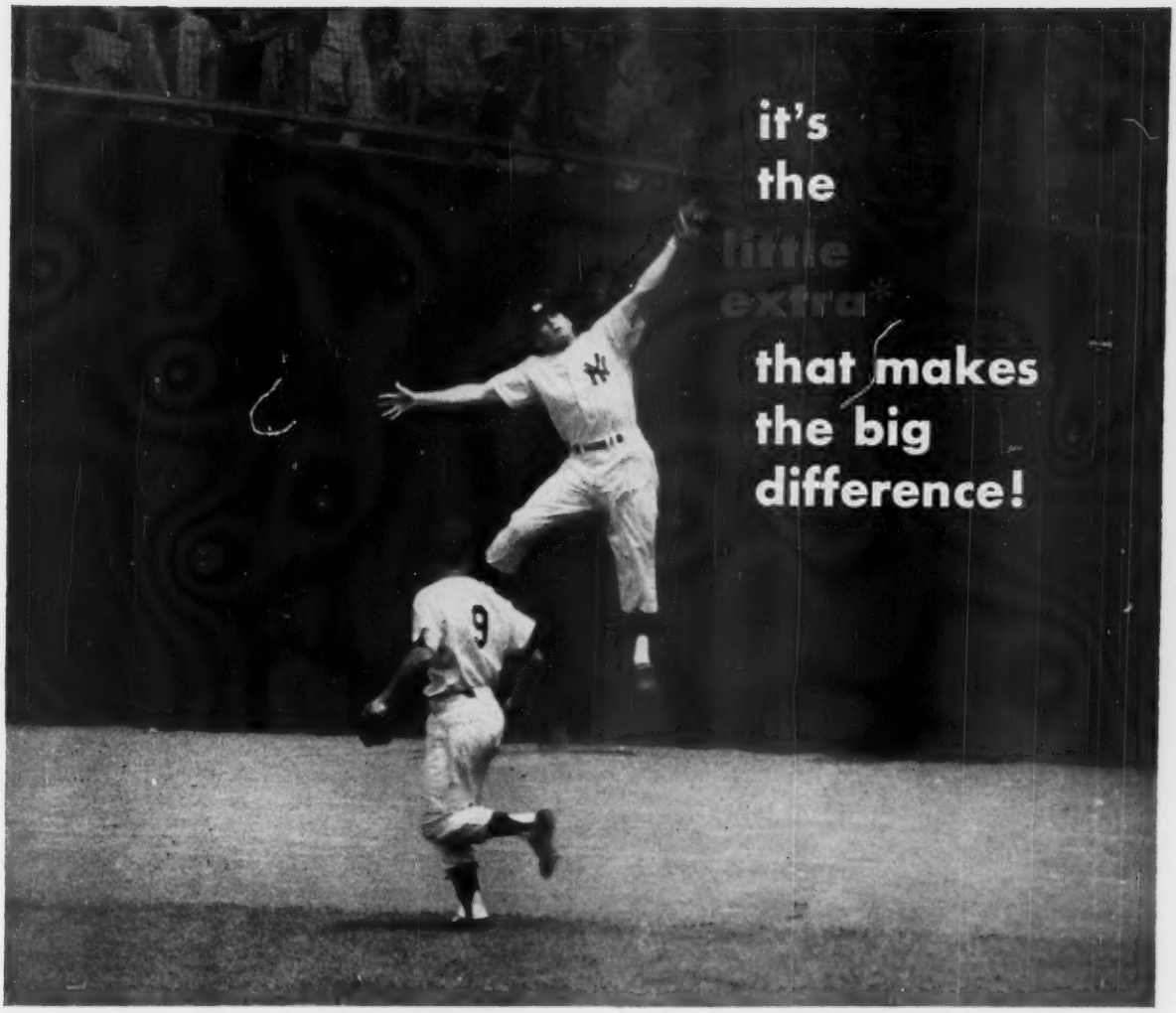

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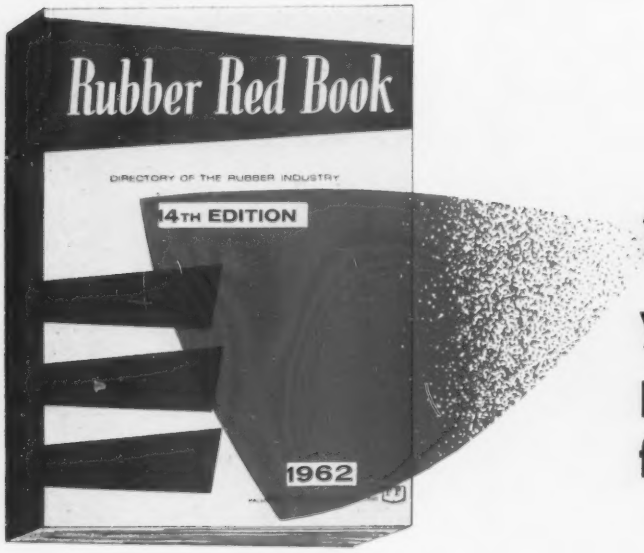

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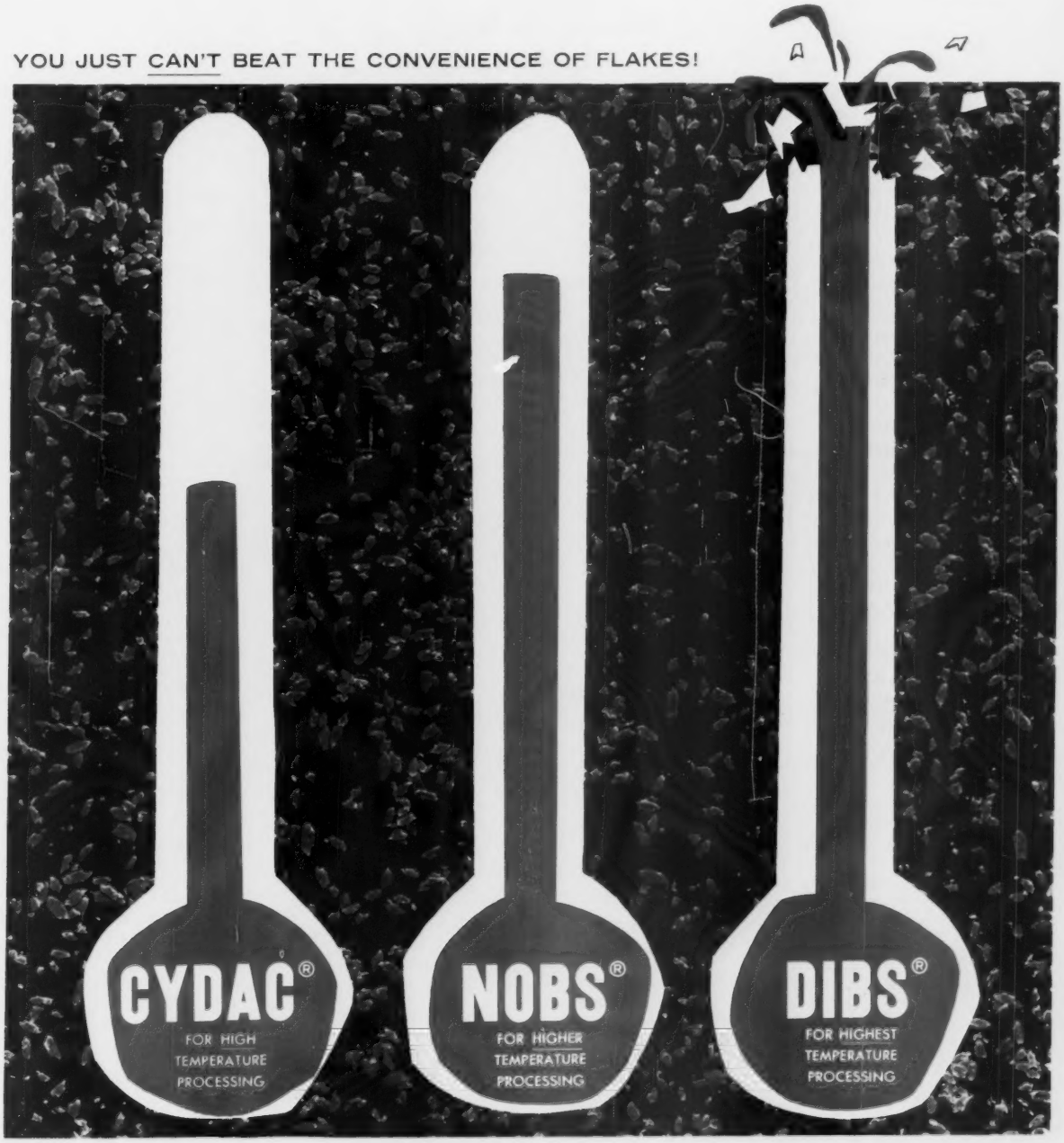

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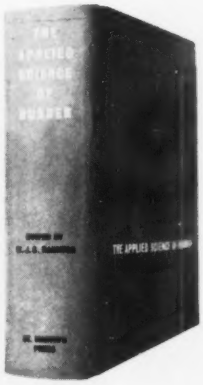

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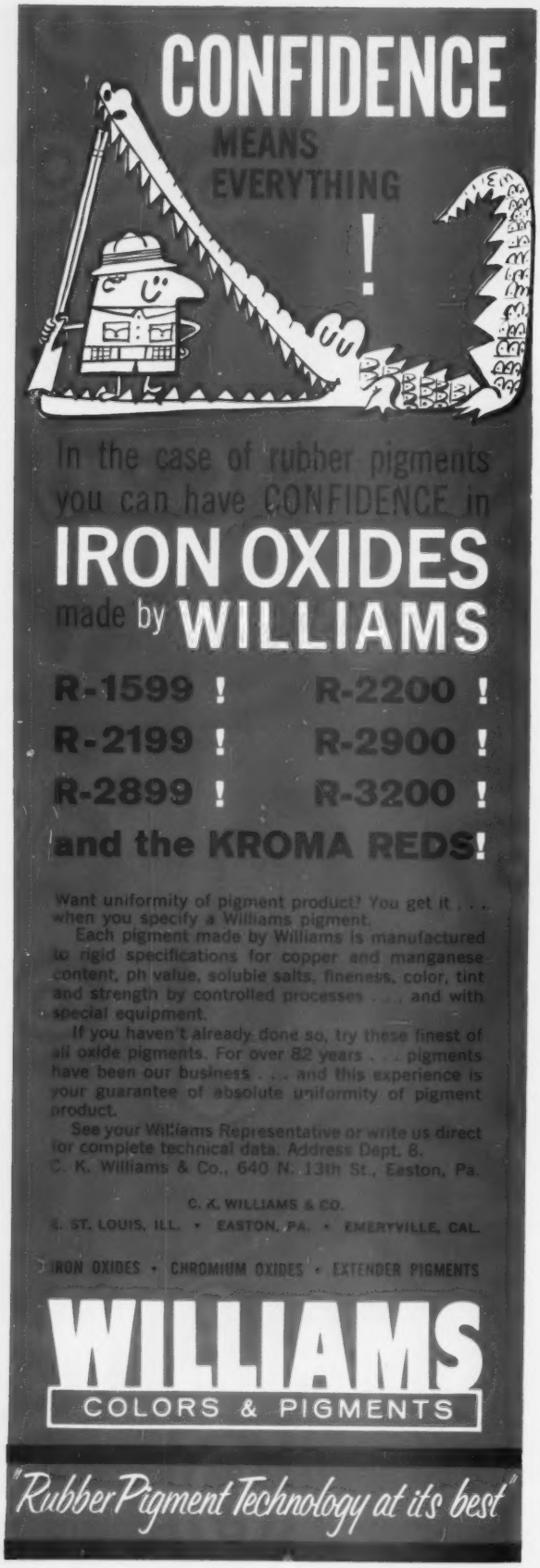
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PATENT REVIEW

by Melvin Nord

Wet Spinning Plasticized Elastomeric Polymers

U. S. Patent 2,965,437, issued December 20, 1960, to Richard N. Blomberg and assigned to E. I. du Pont de Nemours & Co., provides a process for wet spinning plasticized elastomeric polymers and subequently removing the plasticizer.

In the wet spinning process for forming fibers, a polymer solution is extruded through an orifice into a setting bath. This setting or coagulating bath generally contains a proportion of the polymer solvent and a proportion of a liquid which is miscible with the solvent. The fiber is formed as the solvent diffuses out into the bath. This diffusion process, in which the solvent leaves the nascent fiber, is in general accompanied by an inverse process, namely the penetration of the bath liquid into the fiber. The fiber produced by these processes is usually weak and has a chalky appearance because of its open structure. Therefore it must be subjected to further treatment in order to heal the voids of the open structure and raise fiber properties to an acceptable level.

Accordingly it is an object of this invention to provide a wet spinning process for preparing elastomer fibers which have the same high properties as those obtainable by dry spinning. Another object is to provide such a process that does not require a healing step. It is also an object of the invention to provide substantially non-porous and bubble-free elastic fibers with improved and uniform physical properties. These objects are accomplished by extruding into an aqueous coagulating medium, the elastomeric polymer dissolved in a solvent mixture comprising a major proportion of a solvent for the polymer and a minor proportion of an additive or plasticizer which swells the polymer and is substantially insoluble in the aqueous coagulating medium.

The solution of elastomeric polymer can be prepared by direct polymerization in the solvent mixture or alternatively, in some cases, by dissolving the polymer in the solvent mixture. The polymers used in this invention are substantially linear, segmented elastomers. The words "substantially linear" are not intended to exclude structures having branches extending out from the polymer chain but only those which are highly cross-linked. By "segmented elastomers" is meant elastomers having segments of a high melting polymer ("hard" segments) alternating with segments of a low melting polymer ("soft" segments).

In the illustration, polymer solution is delivered through gooseneck (1) to spinneret (2),

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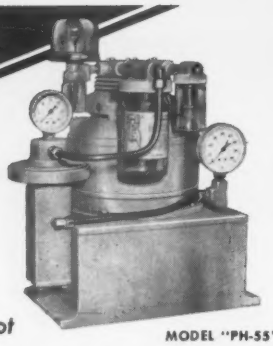

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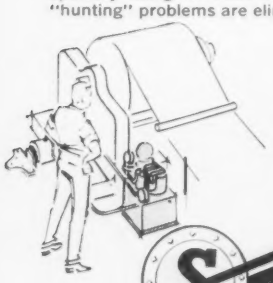

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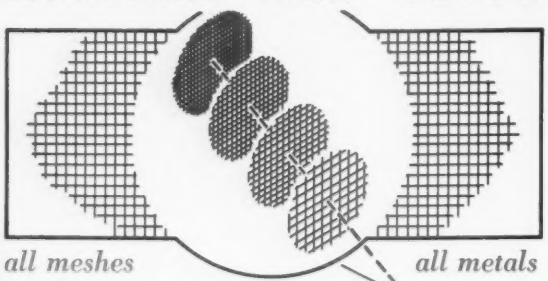

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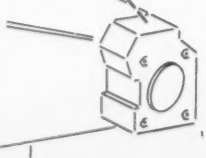

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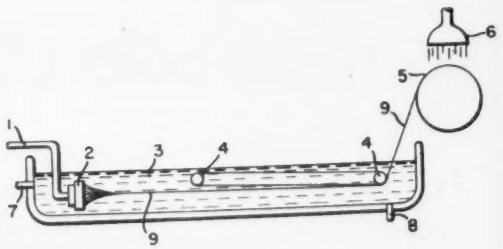
PATENT REVIEW

from which it is extruded into coagulating bath (3); the extruded solution is converted to a gel yarn by loss of solvent to the bath. The yarn (9) then passes several times over canted rolls (4), which serve to increase the length of travel in



the bath, and is removed from the bath and wound up on bobbin (5). The yarn on bobbin (5) is washed by hot-water spray (6). The liquid in the coagulation bath is kept at the desired concentration by being continuously renewed through nozzle (7) and removed through drain (8).

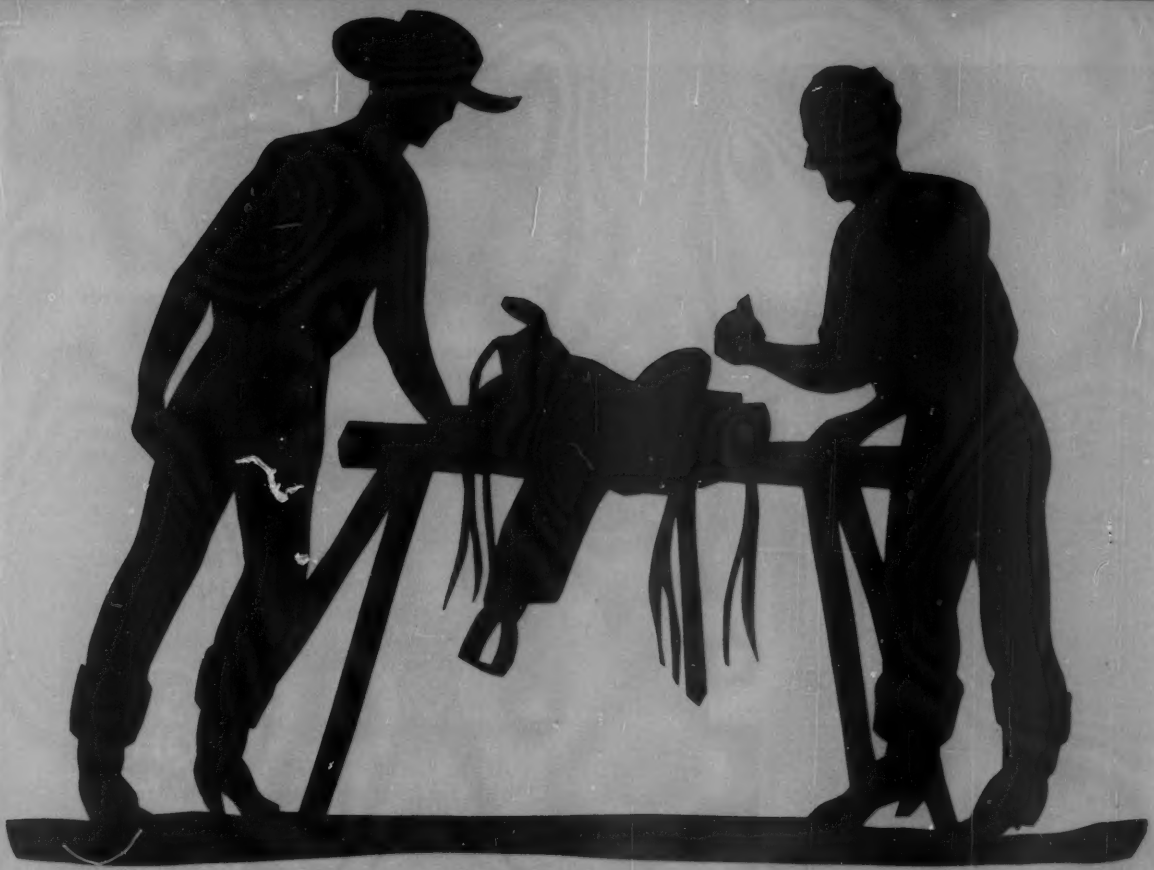
Patch for Tubeless Tires

U. S. Patent 2,956,606, issued October 18, 1960, to Harold L. Beck and Harold E. Boettger, assigned to General Motors Corp., provides a rubber patch element for repairing a tubeless tire.

It consists of a conically tapered plug insertable in a hole in the tire, and a flange portion engageable with the inner surface of the tire adjacent the hole. The patch element has a coating of latex based adhesive on the surfaces engageable with the tire. It also has a heating element embedded in the plug and flange portions, which is electrically energizable to vulcanize the patch to the surfaces of the tire.

Synthetic Rubber Composition

U. S. Patent 2,959,560, issued November 8, 1960, to William B. Watson and assigned to Sinclair Refining Co., discloses a composition consisting essentially of synthetic butyl rubber and 5 to 50 parts per hundred parts of rubber, of a butyl rubber plasticizing and extending agent. This agent is a resin having the following properties: (1) aniline point: 115° to 175° C.; (2) viscosity (SUS at 210° F.): 500 to 25,000; (3) viscosity index: 85 to 210. The resin is obtained in the propane-insoluble raffinate phase obtained in the propane treatment of a Pennsylvania reduced crude.



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PATENT REVIEW

Wire-Reinforced Tire

U. S. Patent 2,960,139, issued November 15, 1960, to Carl F. Engstrom and William J. Shevock, assigned to the U. S. Rubber Co., provides a pneumatic tire construction.

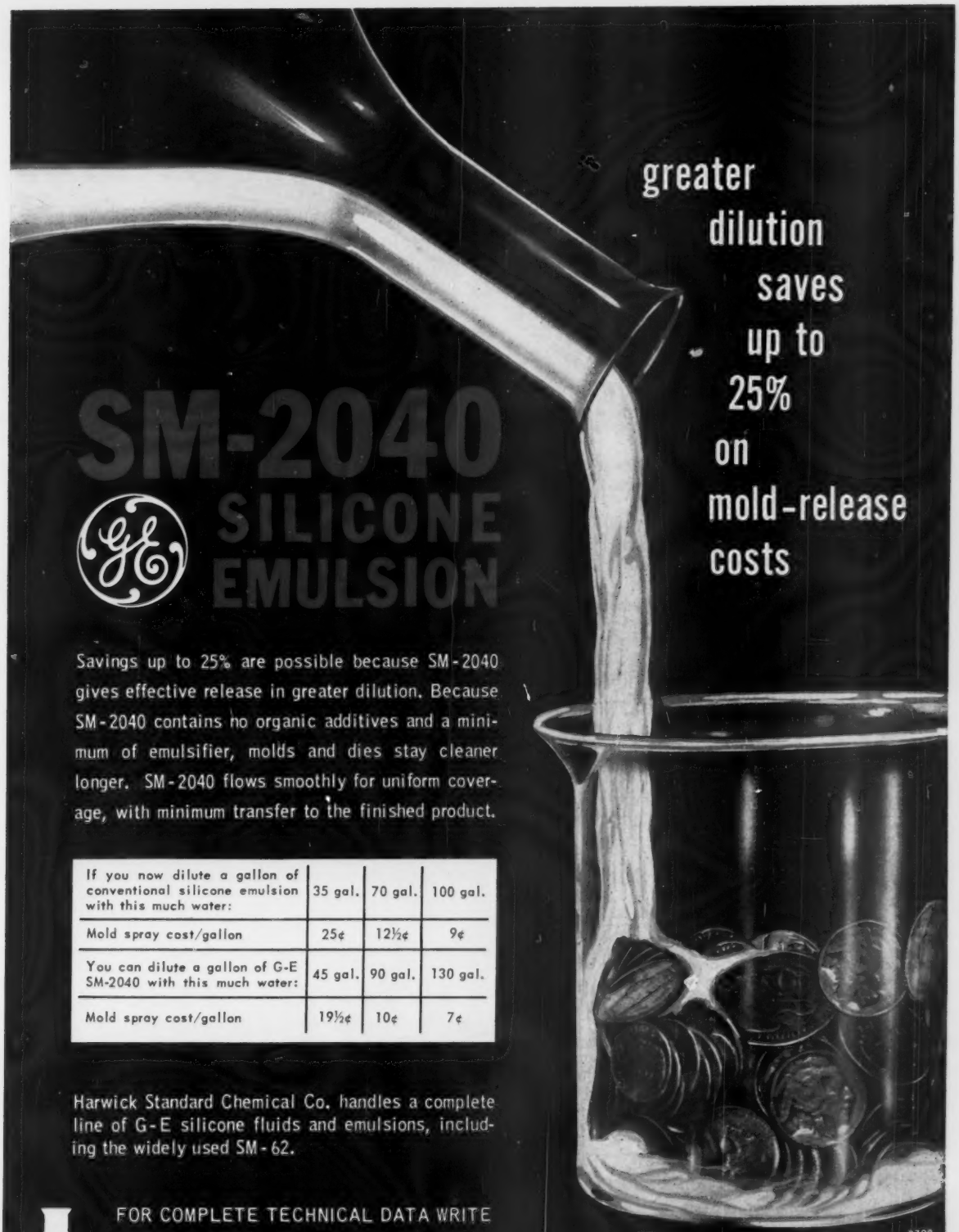
The tire consists of a carcass having rubber tread, buttress and sidewall portions adhering to the tread, a wire breaker assembly disposed in the tread portion over the crown of the carcass, and a layer of wire-reinforced rubber stock disposed in the tread portion over the breaker assembly. The layer of wire-reinforced rubber stock consists of many individual wire fragments randomly dispersed in the rubber, and extending beyond the edges of the breaker assembly and into the buttress portion of the tire.

Traction Augmenting Insert for Tires

U. S. Patent 2,964,082, issued December 13, 1960, to Edward Cousins and assigned to the Goodyear Tire & Rubber Co., provides anti-skid or traction augmenting inserts for imbedding in vehicle tires, which inserts have substantially the same road gripping qualities during their entire useful life.

Other Patents of Interest

Subject	Inventor or Assignee	Patent No.	Date
Machines for building tires	Pirelli S.p.A.	2,956,614	10/18/60
Electronic temperature regulation for vulcanizing tires	Goodyear Tire & Rubber Co.	2,957,066	10/18/60
Method of temporarily reducing the diameter of a tire	Super Mold Corp.	2,957,677	10/25/60
Cellular polyurethane elastomer	General Tire & Rubber Co.	2,957,832	10/25/60
Remolding of tires	Barwell Rubber Co. Ltd.	2,958,098	11/ 1/60
Tire and bead construction	U. S. Rubber Co.	2,958,360	11/ 1/60
Vinyl chloride-dialkyl maleate copolymer latex	U. S. Rubber Co.	2,958,668	11/ 1/60
Tire curing press	National Rubber Machinery Co.	2,959,815	11/15/60
Apparatus for shaping and vulcanizing an air spring	Firestone Tire & Rubber Co.	2,959,817	11/15/60



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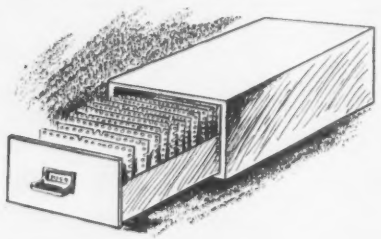

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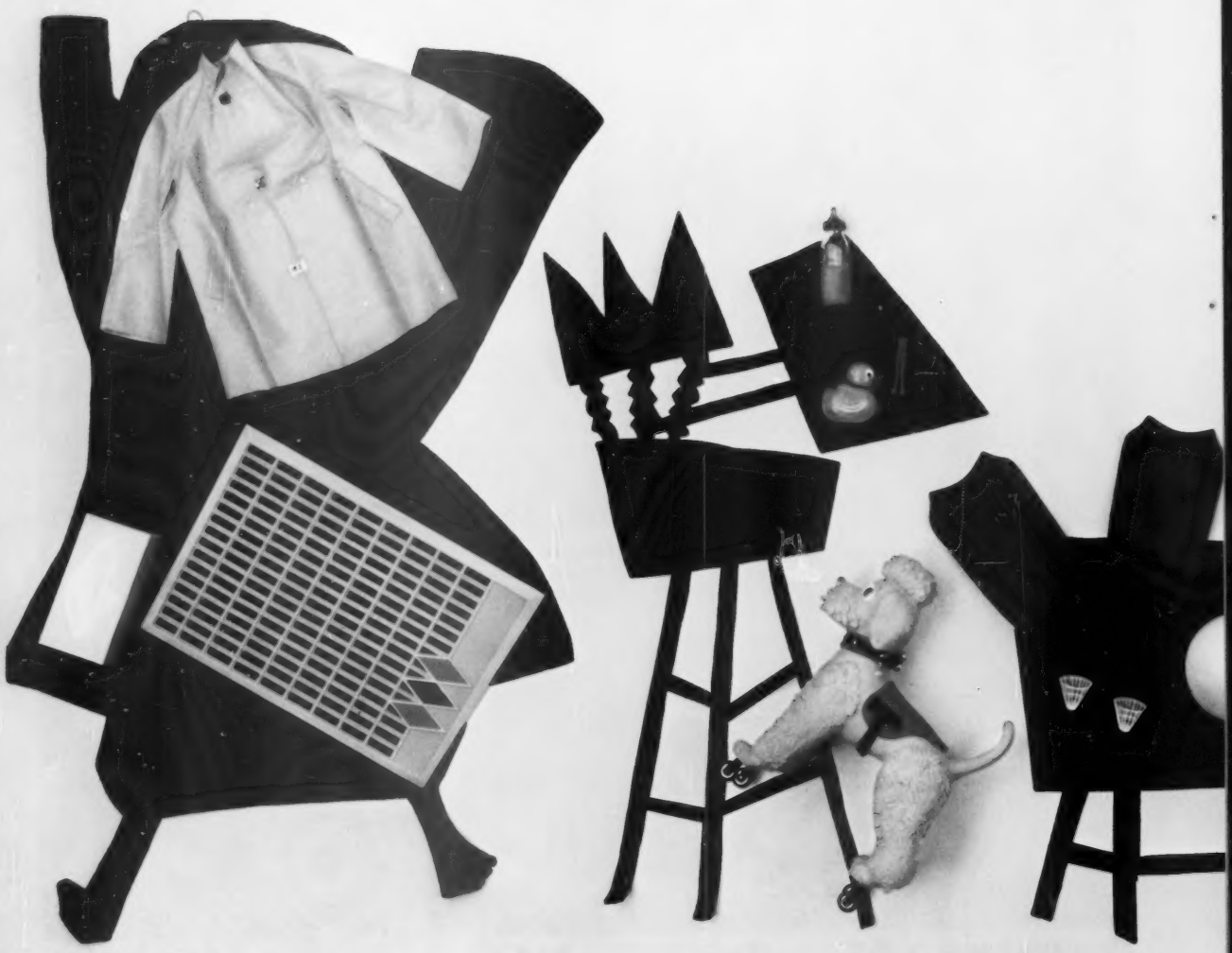

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NAUGATUCK CHEMICAL DIVISION **United States Rubber**

Extending Cis-4 Polybutadiene and Cis-4 Polybutadiene–Natural Rubber Blends

High oil and black levels appear to favorably affect the physical properties and performance of the blends

By R. S. HANMER and W. T. COOPER
Phillips Petroleum Co.
Bartlesville, Oklahoma

MAXIMUM extension of rubber to obtain minimum cost is a well established practice. Of course, extension is limited by quality requirements and some polymers retain desired properties better than others. Cis-4 rubber can be compounded with high black and oil levels while maintaining good physical properties as reported by Railsback, Biard and Haws *(1)* and as further developed in unpublished studies. Natural rubber has frequently been considered to give unsatisfactory results when highly extended *(2, 3)* though this conclusion has been contested by some authors *(4, 5, 6)*. In commercial practice high levels of black and oil extension have not been widely used with natural rubber for tread and carcass applications.

In view of the successful use of higher oil and black levels in Cis-4 polybutadiene alone and in view of the improved service performance when replacing part of the natural rubber in tire compounds by Cis-4 rubber *(1, 7)*, it was of interest to determine the influence of high oil and black levels on blends of Cis-4 rubber and natural rubber. Accordingly, compounding studies were made in which Cis-4 rubber-natural rubber ratios in blends were varied from 100/0 to 0/100, oil levels varied from 5 to 50 phr, and black levels from 45 to 80 phr. Data from these studies were obtained in accordance with the graphical statistical approach suggested by Bertsch *(8)* and are reported here.

Probably of greater interest than the data from compounding studies are the service test results obtained on highly extended Cis-4 rubber-natural rubber blends. These, as well as cost calculations for the extended compounds, are discussed.

This article is based on a paper presented before the Southern Rubber Group, June 24, 1961, at Biloxi, Miss.

Laboratory Studies

Cis-4 polybutadiene employed in this work was commercially available polymer having 95 per cent of its unsaturation in the *cis* configuration and a Mooney viscosity in the range of 40-50 ML-4 at 212° F. The natural rubber for the program was premasticated No. 1 Smoked Sheets.

Stocks were mixed in a "B" Banbury and cured at 292° F. Accelerator levels were selected to give optimum cure in 45 minutes and the data discussed are summarized for this cure time. Laboratory test procedures are described in the references listed at the end of this paper.

The variables in the program were (1) ratio of Cis-4 polybutadiene to natural rubber in the compound, (2) amount of highly aromatic extender oil present, and (3) amount of ISAF carbon black present. In order to compare physical properties for vulcanizates differing widely in respect to these three variations, it was necessary to achieve reasonably equivalent states of cure in all cases. This was done through adjustments in sulfur and accelerator levels based on the amount of oil present and depending on the amount of Cis-4 rubber. The basic formulation follows:

	Parts
Rubber (Cis-4 polybutadiene + natural rubber)	100.0
Philrich 5	5-50
Philblack I	45-80
Zinc oxide	3.0
Stearic acid	3.0
Flexamine	1.0
Wingstay 100	1.0
UOP 288	1.0
Sulfur	1.5-2.25
NOBS Special	0.5-1.0

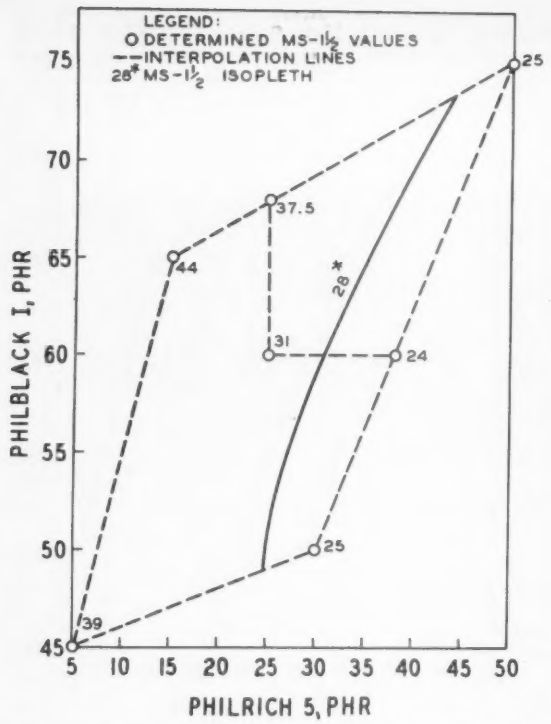

FIG. 1—50/50 Cis-4/natural rubber compounded Mooney (MS-1½ @ 212°F.).

Sulfur and accelerator adjustments were based on the amount of Cis-4 rubber as follows:

Cis-4 Rubber/ Natural Rubber	Sulfur, phr	NOBS Special, phr
100/0	1.5	1.0
75/25	1.5	0.9
60/40	1.5	0.8
50/50	1.5	0.8
25/75	1.5	0.7
0/100	2.25	0.5

The amounts of sulfur and accelerator used for each compound depended, in addition to the Cis-4 rubber-natural rubber ratio, on the amount of oil present. The basic levels given above were for stocks containing 5 phr oil. These levels were increased to compensate for oil in accordance with the following equations:

$$\text{Sulfur, phr} = \text{basic level } (100 + \text{phr oil} - 5)/100$$

$$\text{NOBS Special, phr} = \text{basic level } (100 + \text{phr oil} - 5)/100$$

No curative compensation was made for black level.

The ranges of oil and carbon black loadings indicated in the foregoing basic compound recipe were covered by preparing 7-9 compounds at each of four different Cis-4 rubber-natural rubber ratios. These compounds provided points on a plot for any particular property as a function of carbon black (ordinate) and oil (abscissa). Interpolation between these points by the method of Bertsch *(8)* then permitted construction of isopleths or lines giving constant values for the property under consideration. Figure 1 illustrates the method as applied to compounded Mooney (MS-1½ at 212° F.) for a 50-50 blend of Cis-4 rubber and natural rubber. Figures 2 through 9 summarize data for 100/0, 75/25, 50/50 and 0/100 ratios of Cis-4 rubber-natural rubber. Properties determined were compounded Mooney viscosity, extrusion rate in cc./min., 300 per cent modulus, tensile strength, elongation, heat build-up or hysteresis, resilience and Shore A hardness.

Some of the data required for determination of isopleths as described above were combined with data on 60/40 and 25/75 blends of Cis-4 rubber-natural rubber to permit the construction of bar graphs, Figures 10 through 13. For this purpose particular ratios of ISAF black to oil were chosen to give three compounds for each of 5 rubber blend ratios varying from 75/25 to 0/100 Cis-4 rubber-natural rubber.

Factory Tire Tests

Factory tire tests were conducted on a number of Cis-4 rubber-natural rubber blends utilizing increased levels of carbon black and oil. These were in whole

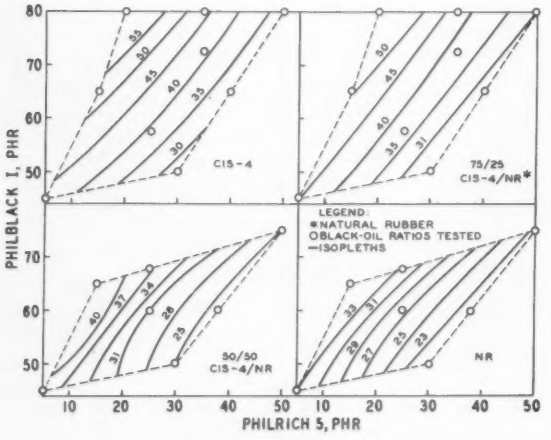

FIG. 2—Compounded Mooney (MS-1½ @ 212°F.).

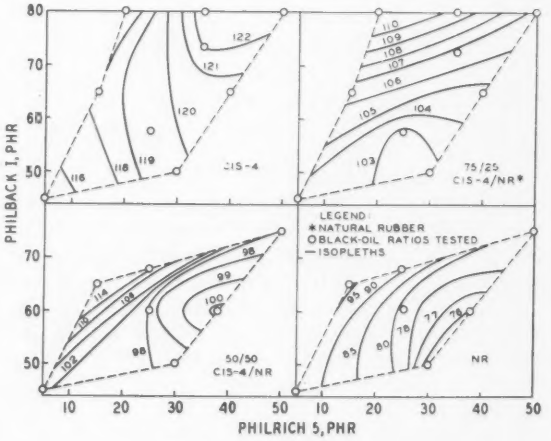

FIG. 3—Extrusion, cc./min.

Summary

Maximum extension of rubber to obtain minimum cost while maintaining satisfactory performance is a well established practice in the rubber industry. The present report describes the influence on physical properties of high levels of oil and of carbon black in Cis-4 polybutadiene compounds and particularly, blends of Cis-4 rubber with natural rubber. Laboratory tests were made with variable ratios of Cis-4 rubber to natural rubber in which oil levels were in the range of 5 to 50 phr and black levels from 45 to 80 phr. The oil was highly aromatic and the black, ISAF. Factory tire tests were run on a number of the extended compounds in 10.00 x 20 truck tire treads using either ISAF or HAF black.

Laboratory data were obtained according to a graphical statistical method and are given as isopleths relating physical properties to oil and black content for each of four rubber blends. The Cis-4 polybutadiene-natural rubber blends seem to be extended more advantageously than does natural rubber. Increase in black level gave an increase in tensile strength with Cis-4 rubber, had little effect on a 50/50 blend and reduced the tensile of natural rubber. Other properties showed normal trends with black and oil loadings but differed in the degree of change according to the amount of Cis-4 rubber present.

Factory tire tests showed increased abrasion resistance as (1) the amount of Cis-4 rubber in the blends was increased, and (2) the amount of ISAF black was increased. Nine groups of 10.00 x 20 truck tires from three different tests gave an average abrasion index of 143 per cent compared to natural rubber at 100 per cent when the experimental compound was a 60/40 blend of Cis-4 rubber-natural rubber with 60 phr ISAF black and 18 phr highly aromatic oil. In a series with HAF black a similar trend was observed but with lower indices reflecting the difference in the blacks. When 70 phr HAF black was used with 22 phr oil in 60/40, 80/20 and 100/0 Cis-4 rubber-natural rubber blend ratios, abrasion indexes were 146, 150 and 161 per cent compared to natural rubber at 100 per cent. These latter tests were on a limited number of tires and are still in progress.

Volume cost calculations were made showing that 60/40 blends of Cis-4 rubber-natural rubber, when extended with 70 phr ISAF black, are equal in cost to stocks of natural rubber with conventional loadings at a natural rubber price of 22c/pound. When calculated on a tire-mile basis, this stock is equal in cost to a control made from 9c/pound natural rubber.

tire 10.00 x 20 truck treads. In each instance the control was the first line construction normally employed by the company building the tires. In most cases the control compound contained natural rubber with 40 to 45 phr ISAF black and 5 phr pine tar softener.

All of the tests for which data are reported were conducted under controlled fleet-test conditions. Three test fleets and three tire factories were involved.

Data were obtained on four different ratios of Cis-4 rubber to natural rubber with HAF black at 50, 60 or 70 phr and 5, 18 or 22 phr highly aromatic oil and ISAF black at 45 or 60 phr and 5 or 18 phr oil. Mileage in each group of tires varied between 15,000 and 30,000 miles and was usually between 22,000 and 30,000 miles. A total of 48 tires, excluding controls, was included in the program.

The data in Figures 2 through 9 summarize changes in physical properties and processing characteristics as functions of the three independent variables in the laboratory program; namely, ratio of Cis-4 rubber to natural rubber, amount of black present and amount of oil present. Table I gives a condensation of all of these data in terms of property changes as a function of independent variables.

All of the stocks extruded fairly well. However, with straight Cis-4 stocks and low black and oil levels, extrusion appearance was not as good as with higher black and oil levels. The effects of black and oil extension on tensile strength with the four rubber ratios was quite different. Cis-4 rubber and the 75/25 Cis-4 rubber-natural rubber blend increased in tensile with increase in black, natural rubber decreased and the

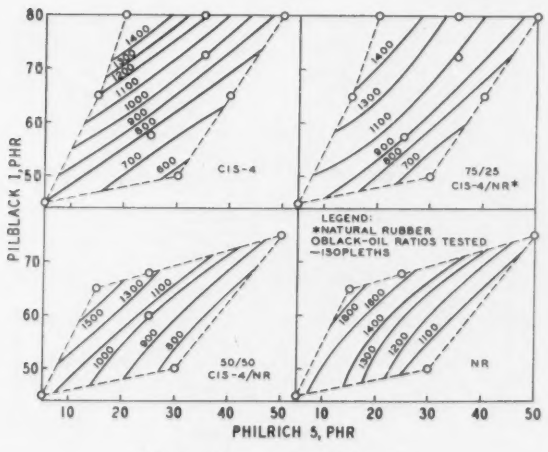

FIG. 4—300 per cent modulus, psi.

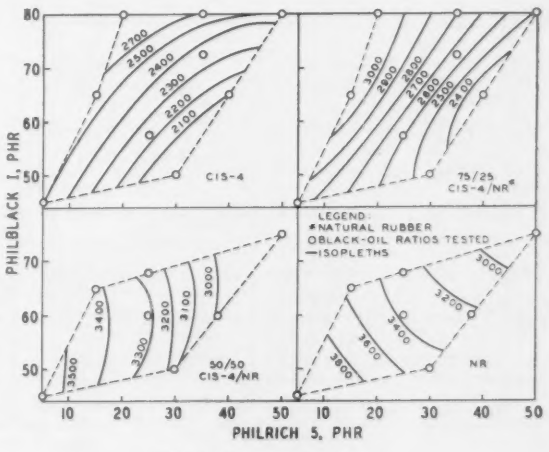

FIG. 5—Tensile strength, psi.

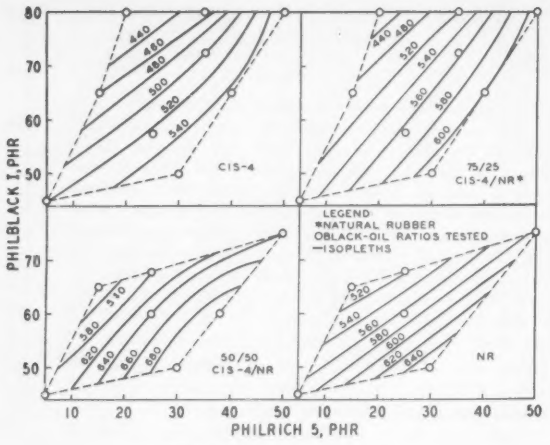

FIG. 6—Per cent elongation.

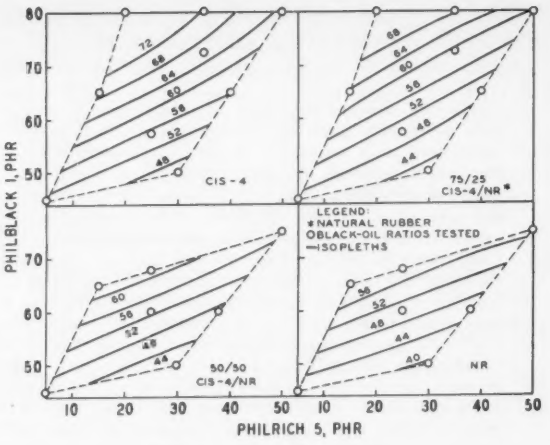

FIG. 7—Heat build-up, in °F.

50/50 blend was little affected. Differences in Shore hardness and heat generation were not large with the different rubber ratios.

Bar Graphs

Data for five combinations of Cis-4 rubber and natural rubber, each at normal levels of black and oil, intermediate levels of black and oil, and at high levels of black and oil, are arranged in the form of bar graphs in Figures 10 through 13. These graphs illustrate trends in physical properties as the amount of Cis-4 rubber is varied while also illustrating the effect of black and oil level for the particular ratios of black and oil chosen. It should be mentioned that the ratios used, 60 phr Philblack I with 20 phr Philrich 5, and 70 phr Philblack I with 30 phr Philrich 5, have been found in these and other studies to give a very satisfactory balance of properties. Information in Figures 10 through 13 is summarized in Table II.

With increase in black-oil extension there was some adverse effect on properties of both the blends and natural rubber. Cis-4 rubber imparted slightly higher heat build-up and resilience and decidedly lower modulus to the blends. Property balances of the blends should be satisfactory for many quality service applications. In particular, the lower modulus imparted by Cis-4 rubber may reduce heat generation in actual tire service *(9)*.

The data used to prepare the bar graphs are given in Tables III, IV, and V. All of the compounds processed satisfactorily with no problems in Banbury mixing or in sheeting-off of batches.

Tire Tests

Tire tests discussed here comprise only those involving factory-built 10.00 x 20 truck tires with whole treads. Data were obtained for 60/40 Cis-4 rubber-natural rubber ratios with 45 and 60 phr ISAF black and with 50, 60 and 70 phr HAF black; for 80/20 ratios with 60 and 70 phr HAF black; and for all Cis-4 rubber with 70 phr HAF black. Also listed are results for 50/50 blends with 45 phr ISAF black to provide additional comparison of the influence of the amount of Cis-4 rubber in the blends on road wear. The results are summarized in Table VI.

The first two compounds differ in the Cis-4 rubber-

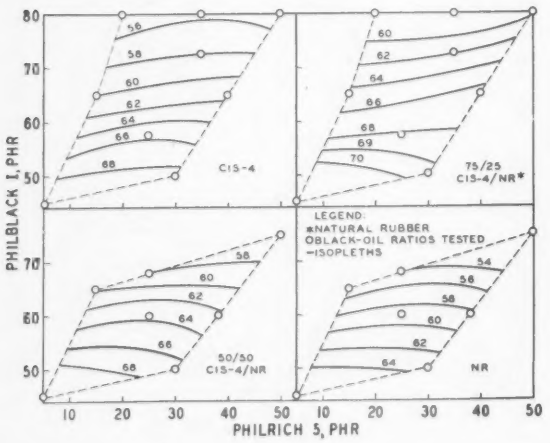

FIG. 8—Resilience, per cent.

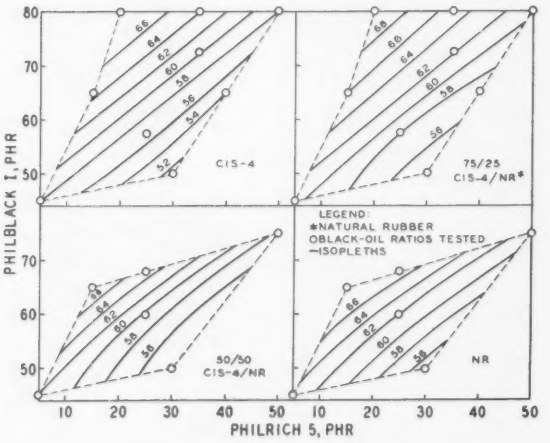

FIG. 9—Shore A hardness test results.

TABLE I—INFLUENCE OF CIS-4 RUBBER-NATURAL RUBBER RATIO, ISAF BLACK LEVEL AND HIGHLY AROMATIC OIL LEVEL ON COMPOUND STOCK AND VULCANIZATE PROPERTIES

	Change in Property			
Property	With Increasing Cis-4 Rubber/ Nat. Rubber Ratio	With Increasing ISAF Black Level	With Increasing Highly Aromatic Oil Level	With Total Extension
Compounded Mooney	Increases	Increases in same way for all rubber ratios	Decreases in same way for all rubber ratios	Changes least for NR
Extrusion in cc/min.	Increases	Little change for Cis-4 or NR alone; increases for 50/50 blend more than 75/25	Decreases for NR; increases for Cis-4; little change in blends	Increases for Cis-4; decreases for NR; little change for blends
300% Modulus	Decreases	Increases about the same for all ratios	Decreases same for all ratios	Changes least for Cis-4; changes greatest for NR
Tensile	Decreases	Increases for Cis-4; decreases for NR; no change in 50/50 blend	Decreases for all rubber ratios; least for Cis-4	Decreases greatly in NR; little change in Cis-4
Elongation	Decreases	Decreases same for all ratios	Increases for all ratios; least for Cis-4	Little change for Cis-4 and NR; some increase in blends
Heat Build-up	Increases	Increases greater as Cis-4 increases in blend	Decreases some for all ratios	Increases for all ratios
Resilience	Small increase	Decreases same for all ratios	Little change for all ratios	Decrease due to higher black for all ratios
Shore A Hardness	No change	Increases same for all ratios	Decreases some for all ratios	Little change for all ratios

natural rubber ratio between 50/50 and 60/40 at normal levels of ISAF black and oil. Average abrasion indexes show a 7 per cent improvement obtained by increasing the Cis-4 rubber content from 50 to 60 per cent in the tread stock. Compounds 2 and 3 show that a 22 per cent improvement in abrasion index is obtained by increasing the ISAF black level from 45 to 60 phr in 60/40 Cis-4 rubber-natural rubber blends. This change requires an adjustment in oil level which was from 5 to 18 phr in this case.

A similar trend was found in 60/40 blends with HAF black as illustrated by the data for compounds 4, 5 and 6. As the black level increased from 50 to 60 only a small improvement was noted; but at the 70 phr level of HAF black the index increased 25 per cent over that for the 50 phr HAF black compound. Only one test is reported at the 70 phr black level—this test is in progress.

Increasing the amount of Cis-4 rubber in the blend from 60/40 to 80/20 while keeping the HAF black level constant at 60 or 70 parts results in a small improvement of 3 to 4 per cent. This is shown by comparing compound 5 to 7 and compound 6 to 8. The trend continues to 100 per cent Cis-4 rubber, compound 9, which showed an average rating of 161 in two tests.

TABLE II—INFLUENCE OF CIS-4 RUBBER-NATURAL RUBBER RATIO ON PROPERTIES OF VULCANIZATES EXTENDED WITH ISAF BLACK AND HIGHLY AROMATIC OIL

	Change in Property with Increase in Cis-4 Rubber Fraction:		
	1	*2*	*3*
Property	at Normal Level of Black and Oil 45/5	at Intermediate Level of Black and Oil 60/20	at High Level of Black and Oil 70/30
Compounded Mooney	Increases	Increases—lower values than in (1)	Increases—lower values than in (2)
Extrusion Rate, cc/min.	Slight increase	Increases—goes through max. at 50/50 blend	Increases—goes through max. at 50/50 blend
300% Modulus	Sharp decrease between 0/100 and 25/75 blend, then slow decline	Decreases—values higher than (1)	Decreases—same as (2)
Tensile	Slight decrease	Slight decrease—values lower than (1)	Very slight decrease — values lower than (2)
Elongation	Pronounced max. for 25/75 blend	Same as (1) with slightly lower values	Same as (1) with slightly lower values than (2)
Shore A Hardness	Little change	Little change—harder than (1)	Little change—harder than (2)
Heat Build-up	Slight increase	Slight increase—about 10 degrees higher than (1)	Maximum at 25/75 ratio — higher values than (2)
Resilience	Increases	Increase smaller than (1) with lower values	Slight increase—values lower than (2)

TABLE III—VARIABLE CIS-4 RUBBER-NATURAL RUBBER RATIO TREAD COMPOUNDS
45 PHR PHILBLACK I/5 PHR PHILRICH 5

Cis-4 Rubber	100.0	75.0	60.0	50.0	25.0	—
Natural Rubber	—	25.0	40.0	50.0	75.0	100.0
Philblack I	45.0	→	→	→	→	→
Zinc Oxide	3.0	→	→	→	→	→
Stearic Acid	3.0	→	→	→	→	→
Flexamine	1.0	→	→	→	→	→
Wingstay 100	1.0	→	→	→	→	→
UOP 288	1.0	→	→	→	→	→
Philrich 5	5.0	→	→	→	→	→
Sulfur	1.5	→	→	→	→	2.25
NOBS Special	1.0	0.9	0.8	0.8	0.7	0.5
Processing Properties						
Compounded MS–1½ at 212°F.	44	45	40	39	38	33
Extrusion, cc/min.	115	103	105	102	100	94
Rating[a]	7	10	12—	12—	11+	11
Physical Properties (45 Minutes Cure at 292° F.)						
300% Modulus, psi	800	980	1090	1140	1170	1660
Tensile, psi	2500	2850	3270	3560	4030	4130
Elongation, %	520	530	580	600	640	570
Heat build-up, °F.	51	47	45	46	46	41
Resilience, %	70	73	73	71	70	67
Shore A Hardness	58	60	60	62	59	64

[a] 3—poorest; 12—best.

Cracking and cutting resistance of the experimental treads in this program was, in general, better than that of the control tires. Some tests showed more cracking than others, but when this condition was noted, it was found that cracking was also more severe in the controls. With one exception the experimental compounds contained 1.5 phr sulfur which is the recommended level for Cis-4 rubber-natural rubber blends for resistance to cracking and cutting *(10)*.

Severity of test conditions was observed to affect the relative performance of the Cis-4 rubber-natural rubber blends. This is shown dramatically in Table

TABLE IV—VARIABLE CIS-4 RUBBER-NATURAL RUBBER RATIO TREAD COMPOUNDS
60 PHR PHILBLACK I/20 PHR PHILRICH 5

Cis-4 Rubber	100.0	75.0	60.0	50.0	25.0	—
Natural Rubber	—	25.0	40.0	50.0	75.0	100.0
Philblack I	60.0	→	→	→	→	→
Zinc Oxide	3.0	→	→	→	→	→
Stearic Acid	3.0	→	→	→	→	→
Flexamine	1.0	→	→	→	→	→
Wingstay 100	1.0	→	→	→	→	→
UOP 288	1.0	→	→	→	→	→
Philrich 5	20.0	→	→	→	→	→
Sulfur	1.725	→	→	→	→	2.5875
NOBS Special	1.15	1.035	0.92	0.92	0.805	0.575
Processing Properties						
Compounded MS–1½ at 212°F.	44	43	38	37	36	31
Extrusion, cc/min.	119	105	106	105	101	85
Rating[a]	10	12	12	12	12	11
Physical Properties (45 Minutes Cure at 292° F.)						
300% Modulus, psi	960	1180	1100	1220	1260	1520
Tensile, psi	2380	2830	2900	3370	3480	3500
Elongation, %	500	540	580	600	610	540
Heat build-up, °F.	61	55	57	55	57	52
Resilience, %	63	67	64	63	61	59
Shore A Hardness	60	62	61	62	61	64

[a] 3—poorest; 12—best.

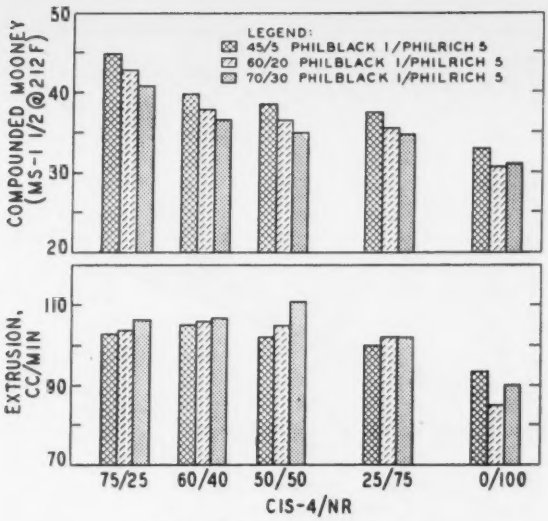

FIG. 10—Processing properties.

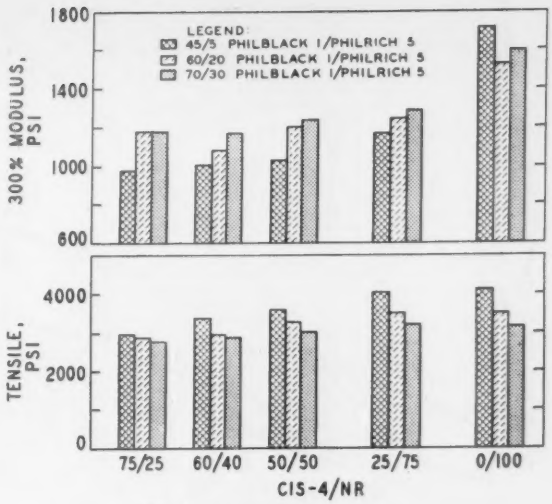

FIG. 11—Stress-strain properties.

VI for compounds 8 and 9. When tested in the drive position rather than trailer, Cis-4 rubber appears to perform 100 per cent better than natural rubber. This response to severity has been observed in other tests of both truck and passenger tires.

These truck tire tests illustrate the advantages to be gained in abrasion resistance by increasing black and oil levels for blends of Cis-4 rubber and natural rubber. Increased performance is also realized by raising the amount of Cis-4 rubber in the blend used.

Compound Volume Costs

In the highly competitive tire market, volume cost of any compound is of great importance. The heavy duty truck tire field may be somewhat less sensitive to volume cost because the high level of performance required to some extent overshadows cost. Nevertheless, a situation where high level of performance can be combined with cost reductions deserves attention.

Increases in abrasion resistance for heavy-duty truck tires were shown in previous paragraphs to result from raising black and oil levels in compounds based on blends of Cis-4 rubber and natural rubber. These changes also bring about lower costs for such compounds. Cost comparisons for 60/40 Cis-4 rubber-natural rubber compounds containing 45, 60 or 70 phr ISAF black and 5, 20 or 30 phr highly aromatic oil are shown in Figure 14 related to the cost for a conventional natural rubber compound with 45 phr ISAF black and 5 phr oil. The curves in Figure 14 are related to delivered cost of natural rubber ranging from 20 to 50c/pound with Cis-4 rubber constant at 30c/pound (the delivered cost for commercial shipments).

At normal levels of black and oil the 60/40 blend is cheaper than natural rubber as long as natural rubber is more than 30c/pound. When higher levels of black and oil are used in the 60/40 blend compound, cost savings are realized compared to natural rubber

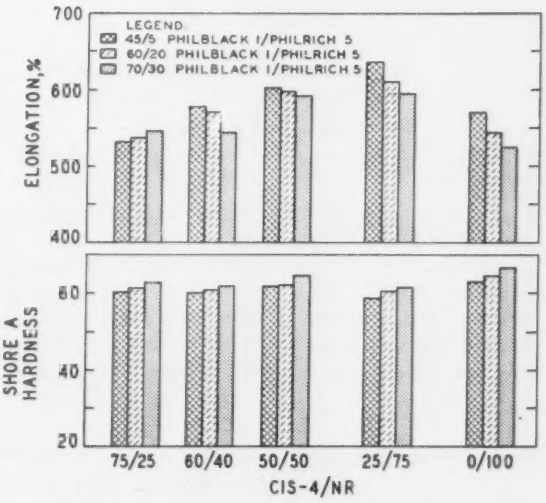

FIG. 12—Elongation-Shore hardness properties.

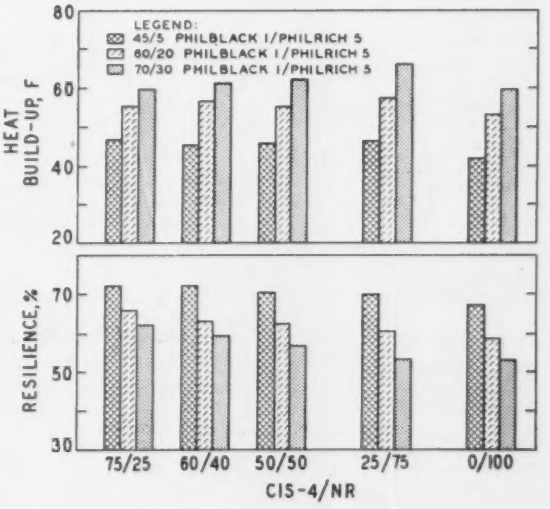

FIG. 13—Hysteresis properties.

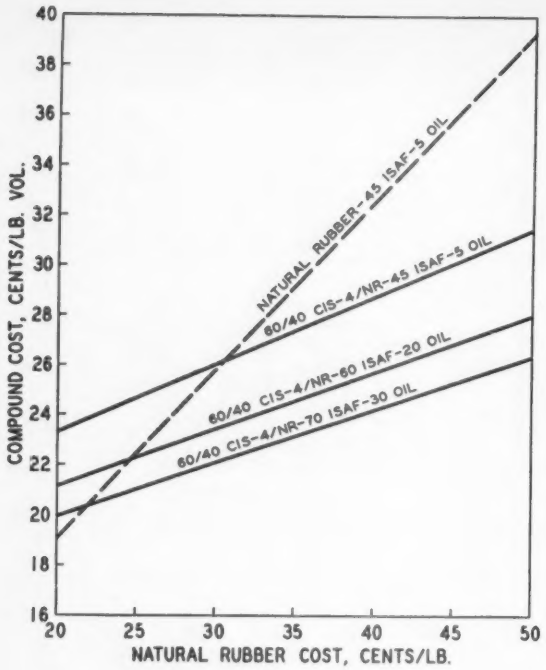
COMPOUND COST, CENTS/LB. VOL.
NATURAL RUBBER COST, CENTS/LB.
NATURAL RUBBER-45 ISAF-5 OIL
60/40 CIS-4/NR-45 ISAF-5 OIL
60/40 CIS-4/NR-60 ISAF-20 OIL
60/40 CIS-4/NR-70 ISAF-30 OIL

FIG. 14—Compound cost comparison.

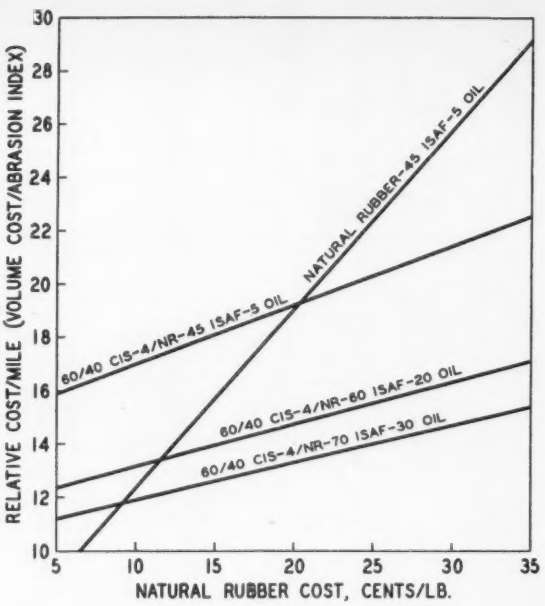
RELATIVE COST/MILE (VOLUME COST/ABRASION INDEX)
NATURAL RUBBER COST, CENTS/LB.
NATURAL RUBBER-45 ISAF-5 OIL
60/40 CIS-4/NR-45 ISAF-5 OIL
60/40 CIS-4/NR-60 ISAF-20 OIL
60/40 CIS-4/NR-70 ISAF-30 OIL

FIG. 15—Comparison of cost per mile for Cis-4/ natural rubber compounds.

down to as low as 22c/pound depending on the amount of black and oil used.

Another way of expressing savings to be realized from use of high black and oil levels for blends of Cis-4 rubber and natural rubber is shown in Figure 15. In this case the cost of different compounds is given in arbitrary units plotted against natural rubber cost. The curves were obtained by dividing the cost curves in Figure 14 by the appropriate abrasion indexes as taken from Table VI. In the case of the 70 ISAF-30 oil compound an abrasion index of 150 was used based on the relationship in Table VI for HAF black since data were not available for a 70 phr ISAF compound.

Note in Figure 15 that the equivalence point for standard black and oil levels is shifted from 30c/pound

TABLE V—VARIABLE CIS-4 NATURAL RUBBER RATIO TREAD COMPOUNDS
70 PHR PHILBLACK I/30 PHR PHILRICH 5

Cis-4 Rubber	100.0	75.0	60.0	50.0	25.0	—
Natural Rubber	—	25.0	40.0	50.0	75.0	100.0
Philblack I	70.0	→	→	→	→	→
Zinc Oxide	3.0	→	→	→	→	→
Stearic Acid	3.0	→	→	→	→	→
Flexamine	1.0	→	→	→	→	→
Wingstay 100	1.0	→	→	→	→	→
UOP 288	1.0	→	→	→	→	→
Philrich 5	30.0	→	→	→	→	→
Sulfur	1.875	→	→	→	→	2.8125
NOBS Special	1.25	1.125	1.00	1.00	0.875	0.625
Processing Properties						
Compounded MS-1½ at 212°F.	43	41	37	35	35	31
Extrusion, cc/min.	120	107	108	111	101	90
Rating[a]	12—	12	12	12	12	12—
Physical Properties (45 Minutes Cure at 292° F.)						
300% Modulus, psi	1040	1160	1200	1240	1270	1600
Tensile, psi	2380	2740	2900	3000	3170	3160
Elongation, %	490	540	540	590	600	530
Heat build-up, °F.	66	59	61	62	66	59
Resilience, %	60	63	60	58	54	53
Shore A Hardness	61	63	62	64	62	66

[a] 3—poorest; 12—best.

TABLE VI—ROAD TEST RESULTS FOR 10.00 x 20 TRUCK TREADS CONTAINING BLENDS OF CIS-4 RUBBER-NATURAL RUBBER WITH VARIABLE BLACK AND OIL

Compound					Abrasion Index[c]						
	Rubber	Black		Oil[b]	By Groups					Avg. for	Avg. for
No.	Ratio[a]	Type	phr	phr	1	2	3	4	5	Test	Construction
1	50/50	ISAF	45	5	114	110	—	—	—	112	
1	50/50	ISAF	45	5	108	103	—	—	—	105	114
1	50/50	ISAF	50	5	135	—	—	—	—	135	
2	60/40	ISAF	45	5	135	118	128	128	—	127	
2	60/40	ISAF	45	5	118	115	119	127	110	118	121
2	60/40	ISAF	45	5	121	117	—	—	—	119	
3	60/40	ISAF	60	18	144	129	—	—	—	136	
3	60/40	ISAF	60	18	133	130	—	—	—	132	143
3	60/40	ISAF	60	18	150	156	143	151	140	148	
4	60/40	HAF	50	5	121[d]	—	—	—	—	121	121
5	60/40	HAF	60	18	121	125	130	—	—	125	123
5	60/40	HAF	60	18	128	124	118	129	112	122	
6	60/40	HAF	70	22	146	—	—	—	—	146	146
7	80/20	HAF	60	18	121	141	117	—	—	126	126
8	80/20	HAF	70	22	146	121	207[e]	124[f]	—	150	150
9	100/0	HAF	70	22	198[e]	124[f]	—	—	—	161	161

[a] Ratio of Cis-4 rubber to natural rubber. [b] Highly aromatic oil. [c] Abrasion index in relation to factory first line natural rubber tread—in most cases the control contains 40-45 phr ISAF black and 5 phr oil. Mileage for each group generally exceeds 22,000 and ranges from 15,000 to 30,000 miles. [d] Average for two groups. [e] Tested in drive position only. [f] Tested in trailer position only.

to 20c/pound for natural rubber. In other words, based on cost per tire mile, the 60/40 Cis-4 rubber-natural rubber blend is equal in cost to natural rubber at 20c/pound when both contain 45 phr ISAF black and 5 phr oil. With 60 phr ISAF black and 20 phr oil, the Cis-4 blend is competitive with the standard compound when natural rubber is 11c/pound and with 70 phr ISAF black, at a cost for natural rubber of about 9c.

Conclusions

This study indicates that Cis-4 rubber alone and in blends with natural rubber may be extended with rather large amounts of black and oil to obtain tread stocks giving excellent service performance. Such extended compounds permit substantial reduction in compound cost. It was shown that on a cost per tire-mile basis, the highly extended blends are equal in cost to conventional natural rubber compounds when the natural rubber cost is as low as 9c/pound.

TEST PROCEDURES

(1) Mooney Viscosity—ASTM D-927-57T. Compounded Mooney at 212°F., small rotor, 1.5 minutes.
(2) Extrusion—No. ½ Royle extruder with Garvey die. Rated on surface, edge and corner; 12 is best possible rating. See *Ind. Eng. Chem.*, Vol. 34, p. 1309 (1942).
(3) Tensile Tests—ASTM D-412-51T. Tested at 80°F.
(4) Heat build-up. ΔT — ASTM D-623-58, Method A. Goodrich Flexometer, 143 psi load, 0.175 inch stroke. ΔT equals rise in temperature above 100°F. oven in 15 minutes.
(5) Resilience—ASTM D-945-55, modified, Yerzley Oscillograph. Test specimen right circular cylinder 0.70-inch diameter and 1.0-inch height.
(6) Hardness—ASTM D-676-58T, Shore Durometer Type A. 80°F. test temperature.

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Stress Relaxation

New apparatus for measuring the degradation of elastomers exposed to ozone

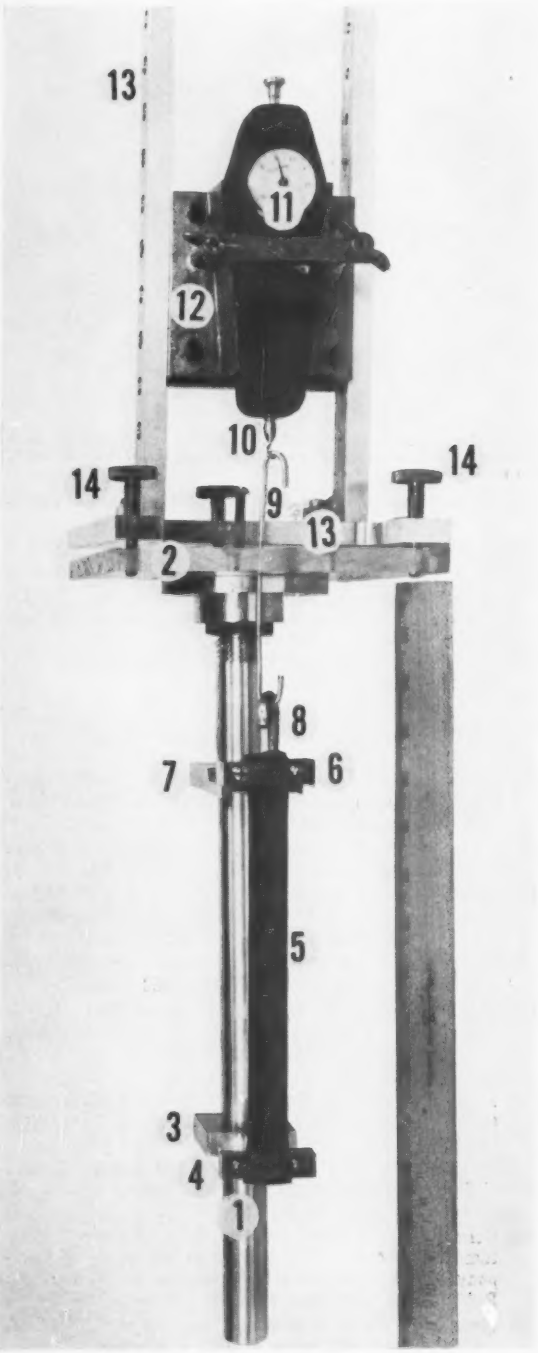

FIG. 1—Tensile stress relaxation apparatus.

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THE experiments made by Crabtree and Kemp *(1)* definitely indicate that ozone is the primary cause for surface cracking of elastomeric materials. Experimental evidence obtained by various investigators supports the contention that ozone destroys the carbon double bond of molecules located near the surface of elastomers that are in a stressed or elongated condition. Destruction of a portion of the network chain transfers additional stress to portions of the same and adjacent molecular chains, thereby predisposing other carbon double bonds to attack by ozone. When a sufficiently large number of chains are broken a visible crack appears on the surface of the elastomer. These cracks are aligned perpendicular to the direction of stress, and their size and number depend on the magnitude of the strain, the concentration of ozone, and the time and temperature of exposure.

Previous Methods

Many of the apparatuses and procedures used by investigators in this field have been confined to techniques such as measuring the time required for the appearance of the first crack, counting the number of cracks, measuring crack depth or determining changes in molecular viscosity of elastomers in solution. These techniques are very useful and considerable valuable information on the degradation of elastomers by ozone has been obtained from their use. However, such tests as applied to solid elastomer specimens are subject to one or more of the following criticisms: (1) they are time consuming; (2) they depend on subjective observations; and (3) the tests do not provide reproducible results.

Since cracking of the elastomer by ozone tends to relieve stress and since the Laboratory had developed apparatus for measuring stress relaxation in tension *(2)*, it was reasoned that similarly constructed apparatus could be used to measure quantitatively the degradation of elastomeric materials by ozone.

The tensile stress relaxation apparatus constructed for this investigation is shown in Figure 1 (numbers

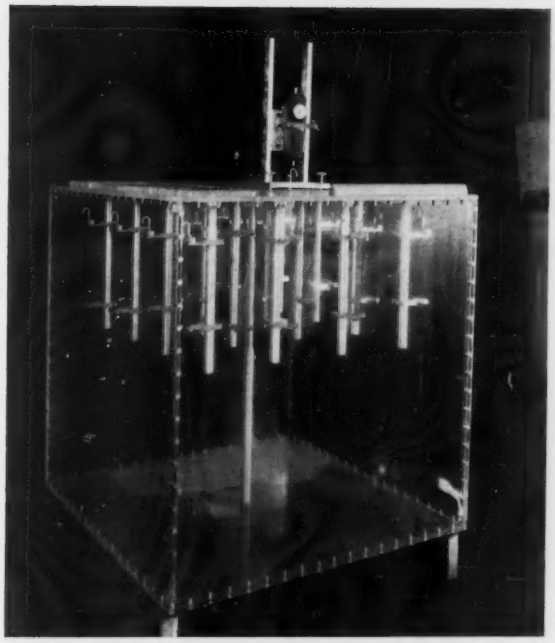

FIG. 2—Ozone exposure chamber showing 16 tensile stress relaxation apparatuses and the force gauge.

in Figure 1 are referenced in the text). The apparatus consists essentially of a rod (1) which is secured to a Plexiglas cover (2). The rod has a lower bracket (3) which has permanently secured to it a clamp (4) which holds securely the lower end of a specimen of elastomeric material (5). The bracket (3) is positioned on the rod so that the specimen is at a desired elongation when the clamp (6) attached to the upper end of the specimen is resting on the upper bracket (7). Clamp (6) is provided with a hooked bolt (8) which is connected by a link (9) [which passes through a hole in the cover (2)] to the hook (10) of the force gauge (11). The force gauge is secured to a holder (12) which is bolted to a jig (13). Not shown in Figure 1 is a thumb-screw for lifting the force gauge relative to the jig. Also not shown is a 1½ volt dry cell, bulb and leads used in an electrical circuit, a part of which is the metal-to-metal electrical contact between the clamp (6) and bracket (7).

The arrangement of the apparatus is such that when the thumb-screw is turned, the force gauge is lifted vertically, thereby exerting an upward force on the clamp (6). When this upward force exceeds the restoring force of the specimen, which is exerting a downward force on the clamp, the clamp is lifted free of the bracket, thereby interrupting the electrical circuit between these parts. At this instant the reading on the force gauge is equal to the restoring force (back load) in the specimen.

An ozone test chamber was constructed from Plexiglas and made sufficiently large to accommodate sixteen tensile stress relaxation apparatuses, as shown in Figure 2. Each stress relaxation apparatus was designed so that it could be easily positioned in and removed from the ozone test chamber. In addition, the jig which holds the force gauge was designed with locating pins (14) (see Figure 1) which fit into alignment holes in the Plexiglas cover (2) so that the force gauge could always be located in the identical position in the cover of each of the relaxation apparatuses. The portions of the apparatus below the cover were made of aluminum and the ozone chamber was made of Plexiglas to minimize destruction of ozone.

Ozone Generation and Measurement

A model XBD generator manufactured by General Ozone Corp., Chicago, Ill., was connected to the test chamber, as shown in Figure 3. Although the generator could supply a very large volume of concentrated ozone, only a small portion of the ozone generated, together with a large volume of metered make-up air, were supplied to the test chamber to maintain the desired concentration of 50 $\pm$ 5 parts of ozone per 100,000,000 parts of air. The outlet from the chamber was exhausted outside the building.

For reasons of convenience and ease of manipulation, colorimetry was selected as a promising method of measuring the concentration of ozone in the test chamber. The method is based on the fact that ozone reacts with potassium iodide in an aqueous solution to liberate iodine in accordance with the reaction,

$$2\ KI + O_3 + H_2O = I_2 + O_2 + 2\ KOH$$

The amount of iodine liberated in the above reaction is then determined colorimetrically using a suitable color indicator.

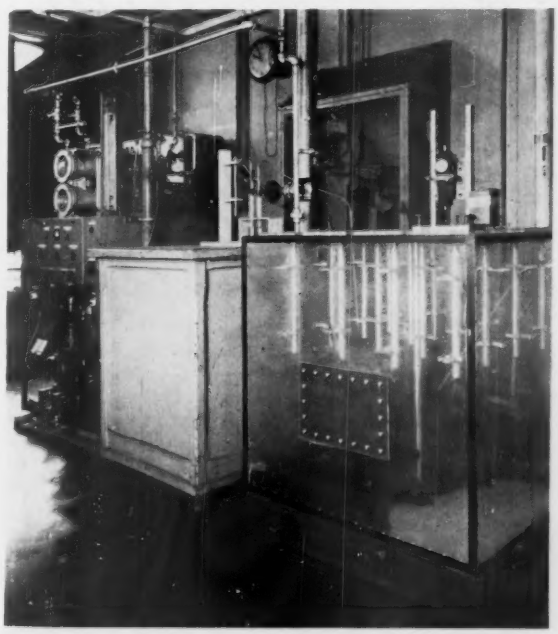

FIG. 3—Overall view of exposure chamber and ozone generator.

Laboratory work was first undertaken to determine the colorimeter reading obtained for decreasing amounts of iodine until no reading could be obtained. The iodine was dissolved in a buffer solution consisting of 1½ volumes of 0.025 molar disodium hydrogen phosphate and one volume of 0.025 molar potassium dihydrogen phosphate. Potassium iodide was added to the buffer until the concentration of the KI therein was two per cent. The color indicator consisted of 1 cc. of five per cent Thyodene solution which was added to 10 cc. of the above iodine solution. Thyodene, a proprietary chemical sold by Fisher Scientific Co., was used because it was claimed that this material produces a more sensitive and sharper endpoint, does not ferment or deteriorate, has excellent stability both as a powder and in dilute solution, and that it dissolves readily in cold water.

As the investigation progressed, it was noted that the colorimeter reading obtained on the iodine-Thyodene solution was inversely proportional to the temperature. Thereafter, the temperature of the solution was treated as an independent variable and measured by a standard procedure within one minute after measurement of the colorimeter reading.

Based on the above work, a family of curves was prepared which related the amount of ozone in 10 cc. of ozonized two per cent potassium iodide solution to the colorimeter reading and to the temperature of the solution. This relationship is shown in Figure 4.

Measurements of the ozone concentration inside the test chamber were made by vacuum pumping a metered quantity of air and ozone from the chamber and permitting this mixture to bubble at a slow rate through three test tubes in series. Each of these tubes contained 20 ml of buffered two per cent KI solution. Following this, 10 cc. of each ozonized solution, in turn, was placed in a colorimeter test tube and 1 cc. of five per cent Thyodene solution was added thereto. The colorimeter reading and temperature of the solution were measured, after which the amount of ozone which reacted with the KI in each test tube was determined by interpolation on the calibration curves (Figure 4). The ozone concentration was calculated as the sum of the amount of ozone in the three test tubes divided by the amount of metered air extracted from the test chamber.

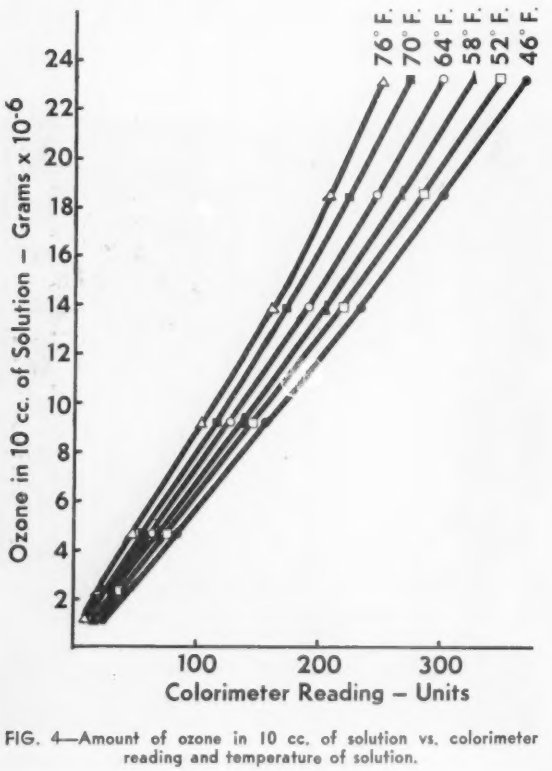

FIG. 4—Amount of ozone in 10 cc. of solution vs. colorimeter reading and temperature of solution.

TABLE I—RECIPE AND CURE FOR TYPICAL MEDIUM-SOFT GASKET MATERIAL

Ingredient	Parts by weight
SBR (1002)	80
SBR standard (1000)	20
Protox 167	5
Philblack A	40
Antiozonant	Added[1]
Flexol TOF	20.0
Methyl Tuads	1.0
Sulfur	1.0

(1) A different antiozonant was added to each individual portion. After addition of the antiozonant the tensile slabs were cured for 10 minutes at 310°F.

The accuracy of the calibration curves shown in Figure 4, was verified by spot check tests using the method described in ASTM D-1149-55T *(3)*. The set-up for making these check tests is shown in Figure 5 and typical results obtained using this procedure are shown in Figure 6. The end point of the titration was taken as the intersection of the lines of the decreasing and constant current portions of the curve in accordance with the procedure described by Vogel *(4)*.

Specimens

The stress relaxation apparatus was used to determine the relative suitability of different commercial antiozonant materials in a typical medium soft gasket material used for watertight and airtight closures on Naval vessels. The recipe and cure for this stock are shown in Table I.

A masterbatch of this stock, without antiozonant was prepared and divided into 14 portions, each weighing 290 grams. One portion was retained as a control and an additional 3 grams of a different antiozonant were added to each of the remaining 13 portions, thus providing an antiozonant concentration of 1.75 parts per 100 parts of elastomer. The antiozonants used are identified by code letters to maintain commercial confidences.

The test specimens consisted of unbuffed strips, measuring ¾ by 6 by 0.075 inches, which were cut

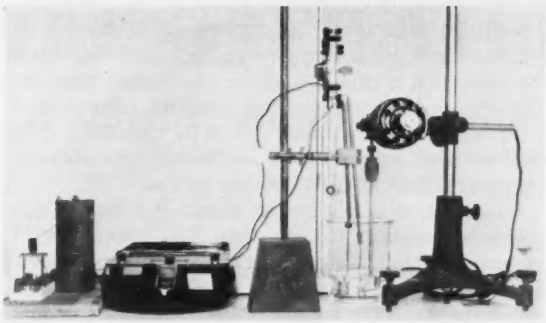

FIG. 5—Overall view of apparatus used for the amperometric method for measuring ozone.

from each of the prepared portions of gasket material. One specimen from each portion was secured to the clamps of a stress relaxation apparatus, which was adjusted so that the specimen would be at an elongation of 50 per cent when the upper clamp was placed on the upper bracket. The above operation was repeated on specimens cut from the other portions so that one specimen from each of the 14 portions was exposed simultaneously in the test chamber. Fourteen of the maximum of 16 specimens were tested at one time as two of the stress relaxation apparatuses were removed to provide openings in the chamber for connections to measure ozone concentration and for an electrical cable connection to a circulating air fan.

Procedure

At a specified time each specimen in turn was quickly elongated 50 per cent and the stress relaxation apparatus was immediately replaced in the test chamber. For one series of tests the chamber was maintained at room temperature with only the amount of ozone normally present in the atmosphere.

The back load of each specimen was measured one minute after elongation and at time periods of approximately 15, 40, 340, 1400 and 1500 minutes thereafter. Following this, a duplicate set of specimens was tested in the same manner except that the ozone generator was operated to maintain an ozone concentration of approximately 50 PPHM inside the test chamber.

The reference back load of the specimen was taken as the value obtained one minute after elongation. The per cent retention in back load after aging for the various periods of time was calculated from the equation:

$$\text{Retention of back load, \%} = \frac{Lt}{La} \times 100$$

where:

Lt = back load measured t minutes after elongation, grams

La = back load measured 1 minute after elongation, grams

TABLE II—TEST RESULTS OF SAMPLES EXPOSED TO OZONE

Specimen,	Time Required for Back Load to Be Reduced to Indicated Percentage of Initial Load, Minutes			
Code	95%	90%	85%	80%
A	190	350	650	1200
I	210	550	950	1300
K	140	300	550	870

Results

Typical results of the percentage retention of back load of three samples plotted as a function of time of exposure in the test chamber operated with no ozone (only that normally present in the atmosphere) and with 50 ± 5 PPHM are shown in Figures 7, 8 and 9. In addition, the number of minutes that the specimens were able to retain 95, 90, 85 and 80 per cent of their respective initial loads when exposed under static conditions to ozone are tabulated in Table II.

Interpretation

In examining the data it should be noted that elongated specimens exposed in the absence of ozone show a decrease in back (or restoring) force due to relaxation of molecular chains. When elongated specimens are exposed in an atmosphere containing

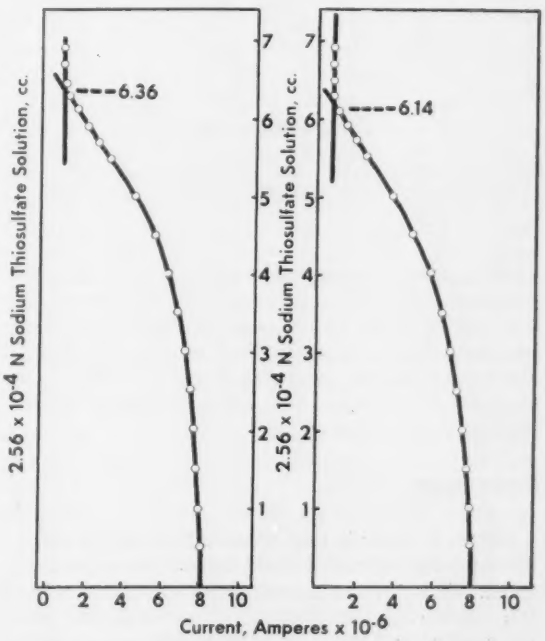

FIG. 6—Amperometric determination of a solution of known iodine concentration showing relationship between titrating solution and current flow.

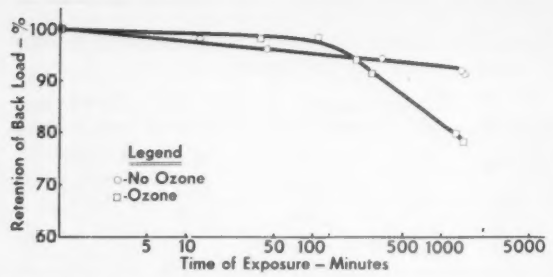

FIG. 7—Retention of back load vs. time of exposure of SBR stock No. 162-1100 compounded with Code "A" antiozonant.

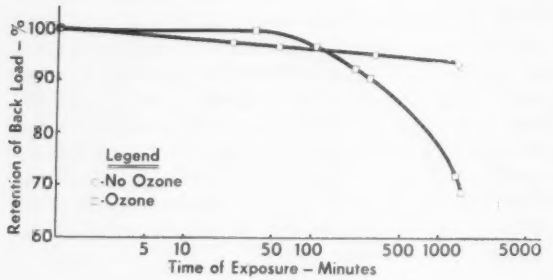

FIG. 8—Retention of back load vs. time of exposure of SBR stock No. 162-1100 compounded with Code "I" antiozonant.

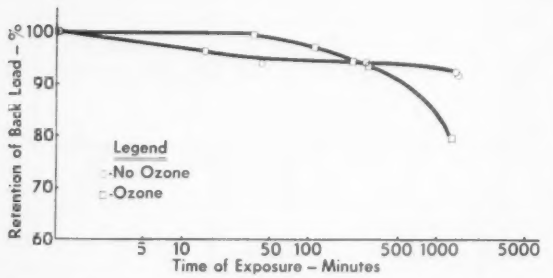

FIG. 9—Retention of back load vs. time of exposure of SBR stock No. 162-1100 compounded with Code "K" antiozonant.

ozone, chain scission and crosslinking of molecules can also occur. Chain scission tends to decrease and crosslinking tends to increase the back load of the specimen. Thus, the total effect on back load of an elongated specimen subjected to ozone attack is the algebraic sum of relaxation, chain scission and crosslinking of molecular chains.

Second Factor

Another factor is that ozone attack occurs only at the exposed surface of an elongated elastomeric material. Thus, an antiozonant must function at or near the surface of the elastomeric material and either react with or form a barrier against ozone. If an insufficient amount of antiozonant is present at the surface or is migrating there at a slower rate than it is being consumed, then ozone cracking will occur. Accordingly, the longer an antiozonant is capable of maintaining a given retention of back load the better the protection it provides to the elastomeric material. The decrease in back load due to tensile relaxation of elongated molecular chains should be subtracted from the back load when tested in an ozone atmosphere to obtain the effect of ozone on the specimen.

Examination of Figures 7, 8 and 9 indicates that specimens exposed for less than 200 minutes in an atmosphere containing 50 PPHM of ozone suffered less reduction in back force than similar specimens exposed for the same period of time in an air atmosphere. This may be due to formation of a relatively inflexible "ozonized" skin on the specimens. However, after the first 200 minutes of exposure the specimens deteriorate more rapidly in an ozone atmosphere.

Conclusion

A method utilizing stress relaxation techniques has been developed for measuring the time rate of decay under static conditions of the back force of an elongated specimen of elastomeric material undergoing attack by ozone. This apparatus can be used for investigating the resistance of elastomers to ozone, the merits of different antiozonants, and may have merit for fundamental studies on the behavior of antiozonants in compounded elastomeric materials. In addition, the stress relaxation apparatus is readily adaptable for making a visual examination of the specimens at selected intervals during the exposure period, as each apparatus can be removed from the test chamber and replaced without manipulation of the specimen or interference with other specimens.

This paper was prepared primarily to present information on the applicability of the tensile stress relaxation apparatus for measuring stress decay of elastomers in an ozone atmosphere. In view of this and as the antiozonants are proprietary materials, no conclusions are provided as to the merits of the antiozonants tested.

The opinions or assertions herein are those of the authors and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

Acknowledgment

The authors wish to thank Mr. C. K. Chatten, Head of the Elastomer Development Section of the Naval Material Laboratory for his assistance and encouragement in the preparation of this paper.

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(2) Pat. No. 2,831,342, Adler, G., and Lichtman, J. Z.

(3) ASTM D-1149-55T, Test for Ozone Cracking of Vulcanized Rubber.

(4) Vogel, A., "Quantitative Inorganic Analysis," pp. 769, 770.

IDENTIFICATION

Of Carbon Blacks For Rubber

A checking-out procedure for fast analysis with simple laboratory equipment

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As bulk handling installations for carbon black multiply, it has become more and more desirable to have available quick methods for their identification. A method is needed for determining, from a sample, the type of black in any bin, tank, or tote box, since the various kinds of black cannot be distinguished easily when in the handling system. Although the identification problem rarely occurs with bagged black, producers have been known to fill "correctly-labeled" bags with the wrong black. The following checking-out procedure is recommended for the solution of the identification problem.

The procedure has been fashioned to segregate the types of black listed in Table I. It includes all the blacks most rubber companies ordinarily use. Within any given type, however, differences can be noted between brands, but these are usually negligibly small.

The tests listed have been selected for two reasons: (1) on their suitability for rubber factory control laboratories which are not elaborately equipped, and (2) on the speed with which they may be done. Using this procedure, identification should be possible within hours. Characterization of the unknown black can be made more quickly and positively if samples of all the blacks ordinarily used are kept on hand for reference purposes.

Initial Tests

Some simple tests can be made at the outset. For example, carbon blacks can be very roughly classified by jetness. On a smooth, horizontal plate or tray make a wedge-shaped pile of the unknown black, flanking it with similar heaps of SRF and HAF blacks. Compare the color of the three black piles in bright daylight or under fluorescent light. If the black is lighter in color than the SRF it should be tested in the procedures with SRF, FT, MT and GPF blacks. If equal to or darker than SRF, but lighter than HAF, comparison with FT, SRF, GPF, HMF and FEF blacks would be indicated. Finally, blacks as dark as HAF or darker should be tested with FEF, HAF, EPC, MPC, ISAF and SAF. A certain amount of overlapping is called for here; this is to take care of the differences in the same type black marketed by different suppliers.

A second rough classification of the black can be made by a pour density test. A standard procedure has been adopted by the ASTM for this test (ASTM D-1513-60) but calls for a calibrated container which may not be available. If this is the case, pour the black into a 250 c.c. graduate until it reaches the top mark, level off at the mark and weight the black. Do not tap the black at any time and average three tests. The pour density is reported in pounds per cubic feet and is easily obtained from the weight in grams of 250 c.c. of black by multiplying by the factor 0.25. As can be seen from Table I, if the pour density is over 36 the black is likely to be a thermal black; between 30 and 36 an SRF black is indicated. Blacks finer than SRF have pour densities so similar that this rough test is inadequate.

Further Tests

For further testing it is helpful if the black is dry. For drying, spread out 100 grams on an aluminum plate—not over ¼-inch deep—and oven dry for one hour at 105°C. After drying, the black should be stored in a clean, dry container with a tight-fitting closure. An actual heat loss determination at 105°C. on the original black can easily be done with a small (1 to 2 gram) sample in a weighing bottle. For our purposes the loss can be considered to be wholly moisture. If this value is under 0.3 per cent the probability of the black being Medium or Fine thermal black is high. If over 1.5 per cent, the black is probably a fine particled oil furnace or channel black.

A first test to characterize the black more specifically is the oil absorption test, done on the dried black. A description of the method is given by Sweitzer and Goodrich *(1)*. In brief, linseed oil is added, dropwise, from a burette (preferably a 5 ml. burette graduated to 0.01 ml.) to a 1.000 gram sample of the black on a piece of plate glass. Before the oil addition, the pellets are broken down by gentle pressure with a spatula. For this test a tapered spatula with a 5 to 6 inch blade is recommended. As the oil is added, it is intimately mixed with the black using the spatula. The end point is reached when the black just forms a coherent plastic ball, and all oil is off the spatula and the plate. This test should not take more than 15 minutes, and a rough preliminary run can easily be made in order to bracket the true value.

The oil absorption is frequently reported as cubic centimeters (c.c.) per gram. Typical oil absorption values are given in Table I. Even allowing for unfamiliarity with the method, this test can be used to divide the rubber black spectrum into three zones. Blacks having oil absorption of 0.55 c.c. per gram

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or less would be thermal blacks. Blacks with oil absorptions of 0.56 to 1.10 c.c. per gram would include SRF, HMF and GPF. A black with over 1.10 would be one of the fine particle oil furnace or channel blacks.

The tinting strength test, one of the most useful in identifying blacks, should be done next. Although this test has many variations, some involving a powered muller instead of hand mulling, or changes in the proportion of ingredients, the following procedure is probably typical.

Equipment required is a piece of plate glass at least one foot wide and two feet long, used as a working surface, and a paint muller. The latter is usually 3 inches in diameter and can be purchased from any laboratory supply house.

To 2.000 grams of zinc oxide placed about 4 inches in from the end of the glass plate add 0.100 grams of the black to be identified, then 1.50 c.c. of raw linseed oil. To a similar weight of zinc oxide, placed about 4 inches in from the other end of the glass plate, add 0.100 grams of an SRF black and again 1.50 c.c. of oil. Using different spatulas, mix the oil thoroughly with the black and zinc oxide in each pile. As in the oil absorption test, the pelleted black is first crumbled with the spatula and then blended with the oil and zinc oxide.

With the samples separate, each pile is given 100 strokes with the hand muller using moderate pressure and swirling during the stroke for better mixing. After each 25 strokes the muller is lifted from the glass and the oil paste collected in one spot before mulling is continued. The muller is, of course, cleaned between mulling of the first and second piles. The pastes are then examined to determine which is darker. To the blacker one, a further 0.100 grams of zinc oxide and 0.075 c.c. of oil are added. The paste to which the oil and zinc oxide have been added is now mulled 25 strokes. Again a comparison is made of the color of the two samples. This is done most easily by placing a small blob of one paste from the tip of the spatula on a microscope slide, then placing a similar blob of the other paste alongside but not touching it. A wide-bladed putty knife is then drawn over the blobs toward the edge of the slide to form smooth, even films, each about the area of a finger nail. The edges of the two films should just touch. Fine differences in shade can be detected when the prepared slide is examined in bright daylight (not direct sunlight) or under fluorescent light.

This process of adding zinc oxide and linseed oil to the darker paste is continued until the two films closely match each other. Since the SRF black has arbitrarily been chosen to have 100 tinting strength, that of the unknown is determined by the relation:

Tinting strength (unknown black) =

$$\frac{\text{Weight of Zinc Oxide in Sample Paste}}{\text{Weight of Zinc Oxide in SRF Black Paste}} \times 100$$

Tinting strength values obtained on samples of the blacks being considered are given in Table I. In this work the National Bureau of Standards SRF black was considered to have a tinting strength index of 100. Because these samples came from different producers certain anomalies appeared. For example, both the MPC and EPC black have the same tinting strength and a sample of ISAF black has a slightly lower tinting strength than the HAF black tested. These results are due to the overlapping of black types from different suppliers. It does not vitiate the identification method, because in most cases reference samples will be available for comparison.

If the identity has been narrowed down to the finer particle blacks such as ISAF and MPC, an easy and definite identification as an oil furnace or channel black can be made by measuring the pH of a water slurry. This test has been standardized by the ASTM as ASTM Method D-1512-60. All channel blacks are acidic, with pH values ranging from 3.0 to 6.0 for the rubber grades. All other blacks listed have alkaline pH values in the range 7.0 to 10.5, depending on black type.

If we followed the identification of unknown black (actually SRF) by this process our steps might be:

By the first test—the one for jetness—we would judge that the black should be classified with SRF, just possibly FT black and GPF, HMF and FEF blacks.

A pour density value of 33.1 pounds per cubic foot would suggest the black was not HMF, FEF or GPF types.

A moisture test result of 0.6 per cent would eliminate FT black as the unknown.

An oil absorption test of 0.73 c.c/gm. would confirm the elimination of FT as the unknown, and also prove the sample is not a GPF or FEF black.

A tinting strength test next gives a tinting strength of 110 for the unknown when the reference black is the NBS Standard SRF black, 103 when the unknown is compared with the SRF black usually used in the plant.

This is confirmatory evidence and the unknown black can now be confidently identified as SRF.

TABLE I—IDENTIFYING CHARACTERISTICS OF PELLETED CARBON BLACKS

Black Type	Trade Abbreviation	Oil Absorption c.c./gm.	Tinting Strength % Std.	Pour Density Lbs./Cu.Ft.
Medium Thermal	MT	0.39	42	41.4
Fine Thermal	FT	0.46	80	38.0
Semi-Reinforcing Furnace	SRF	0.69	100	31.5
Semi-Reinforcing (Oil Type)	SRF	0.69	129	34.9
General Purpose Furnace	GPF	0.99	130	25.3
High Modulus Furnace	HMF	0.76	144	27.5
Fast Extruding Furnace	FEF	1.38	160	22.6
High Abrasion Furnace	HAF	1.21	215	25.2
Easy Processing Channel	EPC	1.22	240	22.5
Medium Processing Channel	MPC	1.14	240	23.3
Intermediate Super Abrasion Furnace	ISAF	1.44	210	23.3
Super Abrasion Furnace	SAF	1.36	245	22.9

LITERATURE REFERENCE

(1) Sweitzer, C. W., and Goodrich, W. S., "The Carbon Spectrum for the Rubber Compounder," *Rubber Age*, Vol. 55, p. 475 (1944).

Urethane Coatings for Rubber Products

Discussing chemical theory, testing methods, characteristics and uses of highly elastic urethane coatings formed from one-package prepolymer systems

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ONE-PACKAGE, highly stable, urethane solution coatings with excellent shelf life and rapid dry have been developed by the proper combination, in optimum mole ratios, of polyfunctional isocyanates and active hydrogen containing reactants. These coatings cure to highly elastic, tough films upon exposure to moisture from the air. Novel techniques have made it possible to produce one-package pigmented varieties based on prepolymer systems. In addition, a wide choice of fast cures is possible by the use of heat or catalysts where accelerated dry time is desired.

These new urethane solution polymers exhibit unique properties which have contributed to their increased acceptance in a wide variety of rubber coating applications. Urethane polymers allow the development of controlled flexibility with the practical result of adequate elongation of the same degree as that of the elastomeric substrate. The combination of this controlled flexibility with the other properties of urethanes will undoubtedly lead to their increased use in the years ahead.

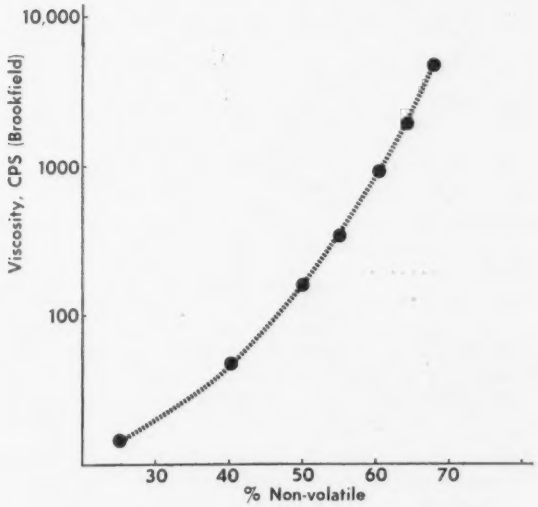


FIG. 1—Prepolymer urethane, viscosity at various dilutions.

Urethane coatings offer a number of inherent advantages for finishing rubber goods. Among these benefits are greatly improved ozone, solvent, chemical and abrasion resistance—combined with flexibility, toughness, and controlled gloss. Also, urethanes offer good adhesion, cold-check resistance, reduced staining and dirt collection, along with major alteration of elastomer surface properties, such as surface tack and friction quality. Prepolymer coatings are particularly beneficial because of their versatility of cure either at room or low baking temperatures.

General Coating Characteristics

Considerable scope is possible in the commercial formulation of urethane rubber coatings. As for all coatings, however, ultimate products represent the optimum balance of overall properties. New technology has made it possible to produce rubber coatings which have definite advantages over previously available types. Table I gives some typical properties of a one-package clear flexible rubber coating. The solids or non-volatile content has been adjusted to approximately 35 per cent with a viscosity in the low range of 20 to 100 centipoises. This coating can be satisfactorily applied by brushing, dipping, or spraying, and will give roughly one mil dry film thickness per coat.

Higher solids contents are readily available, but with a somewhat higher viscosity. An illustrative curve of viscosity versus solids is shown in Figure 1. Pig-

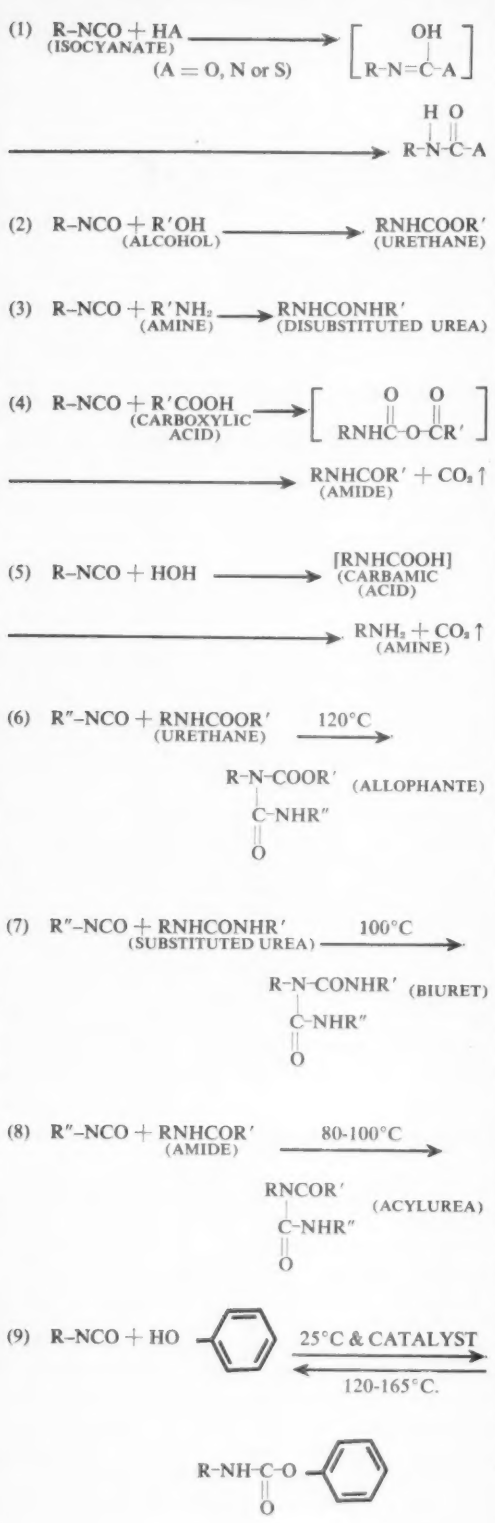


FIG. 2—Isocyanate reactions.

mented coatings have somewhat higher viscosities and are normally thinned slightly for spray application. Coverage, which is primarily a function of solids content, is approximately 500 square feet per gallon at one mil film thickness. The density of the coating polymer is relatively low and this is another factor contributing to the excellent coverage. Tag Closed Cup flash is under 80° F.; however, this is not necessarily a limiting factor as many solvent modifications are possible. The pencil hardness of the fully cured film ranges from 3B to 5B, while film elongation is about 150 per cent. Practical elongation, however, is affected by factors such as the adhesion of the coating, and may be considerably higher.

Depending on the application, either a clear or pigmented coating may be used. In those cases where protection, such as against oil or ozone is required, a clear coating would be recommended. Under unusual service conditions or where it is desired to mask the color or appearance of the substrate, or radically change its surface characteristics, a one-package pigmented flexible prepolymer coating is preferable.

Chemical Principles

The basic chemical reactions of isocyanates (Figure 2) have been rather widely reported *(1, 2)* and are now largely familiar to most technologists. By the use of polyfunctional components in equations 2, 3, or 4 of Figure 2, a pre-reacted condensation polymer can be synthesized which will be soluble in a blend of ester and aromatic solvents. With an excess of isocyanate, a long chain polymer terminating in isocyanate (NCO) groups will result. This "urethane" polymer in solution is commonly referred to as a "prepolymer" coating. However, it may contain urea and amide groups, among others, but "urethane" is rapidly becoming accepted as the generic term.

The curing of this prepolymer is accomplished by atmospheric moisture, heat, or catalysts. The thin

TABLE I—TYPICAL CLEAR PREPOLYMER PROPERTIES

Total Solids	33-37% (ASTM D-1353-56)
Viscosity	20-100 cps at 77° F. (Brookfield Model LVF, Spindle #1, 30 RPM)
Density	Approximately 8.2 lbs./gallon
Storage Life	At least six months in original unopened container at 80° F.
Coverage	Approximately 500 square feet per gallon at 1 mil dry film thickness
Diluent	Anhydrous Mixture:—
	"Cellosolve" Acetate[1] ..... 2 parts
	Toluene ..... 1 part
	Xylene ..... 1 part
Flash Point	Under 80° F. (Tag Closed Cup, ASTM D-56-56)
Color (Film)	Clear, transparent
Color (Liquid)	Approximately 1-4 (Gardner Hellige, 1933)
Hardness (Film)	Pencil Hardness 3B-5B
Elongation (Film)	Approximately 150% (ASTM D-412-51T)

[1] "Cellosolve" Acetate is a product of Union Carbide Corp.

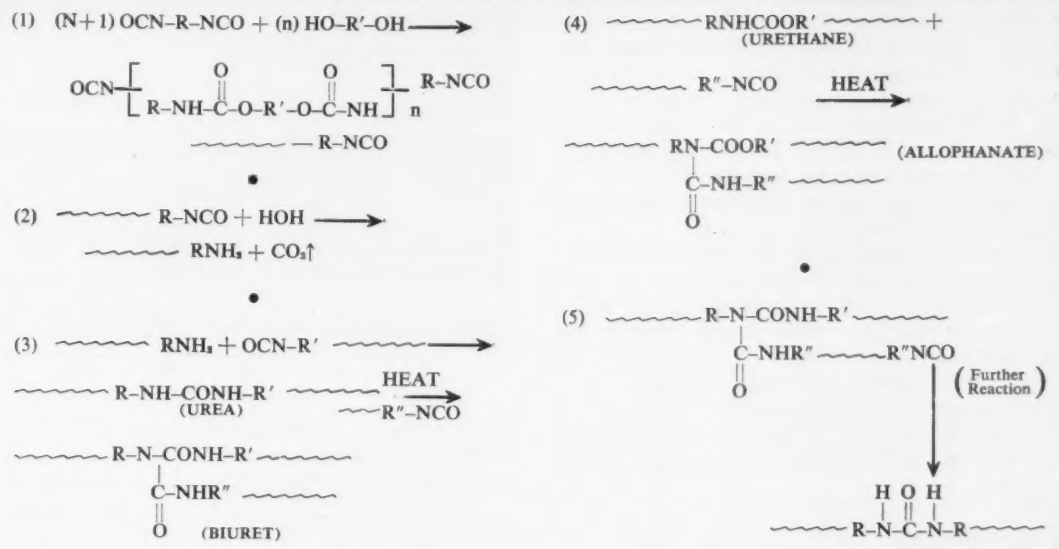


FIG. 3—Idealized representation of prepolymer polymerization by moisture.

film, moisture-curing process is unique and totally unlike other types of coating cure mechanisms.

In this process, cure results from the reaction of excess terminal —NCO groups in the polymer with water to form substituted amines which, in turn, act to chain-extend or cross-link the polymer (Figure 3). This moisture cure mechanism is naturally contingent on the amount of moisture in the air or curing oven. However, satisfactory cures have been obtained at relative humidities as low as 30 per cent. This does not mean that the coating is fully cured, but only that the film has reached a fairly high degree of rigidity due to polymerization accompanied by solvent evaporation. The course of this film curing may be traced by infrared techniques *(3)* or hardness tests (see Figure 4).

By the use of heat curing, a tack-free coating can be obtained on a majority of elastomers in as little as five minutes at 300° F. After this bake and a post-cure of 24 hours at room temperature, properties such as ozone resistance, flexibility, elongation and adhesion will approach maximum. However, about one week at room temperature is required for the development of optimum chemical, solvent, and abrasion resistance properties.

If a faster room temperature cure is desired, small amounts of specific catalysts may be added. Table II lists a number of amine catalysts used in urethane coatings and Figure 5 gives a tabulation of the effects of several selected catalysts, used at one per cent on non-volatile content, on dry time. Of course, such an addition to the coating will then markedly reduce storage life, although generally not below a useful time limit. Shelf life data with several catalysts is shown in Table III.

The reactions involved in urethane foam and rubber are similar to those in coatings. The action of amine catalysts in urethane foam has been studied by Alzner and Frisch *(4)*, among others, and reported as being a function of pH, base rate constant, and concentration. Some weak bases, however, show powerful catalytic action, possibly because of steric effects in the amine molecule. When polyfunctional catalysts such as methyl diethanolamine or "Quadrol" *(5)* are used, some curing is also achieved by crosslinking. Monohydroxyamine catalysts may cause undesirable

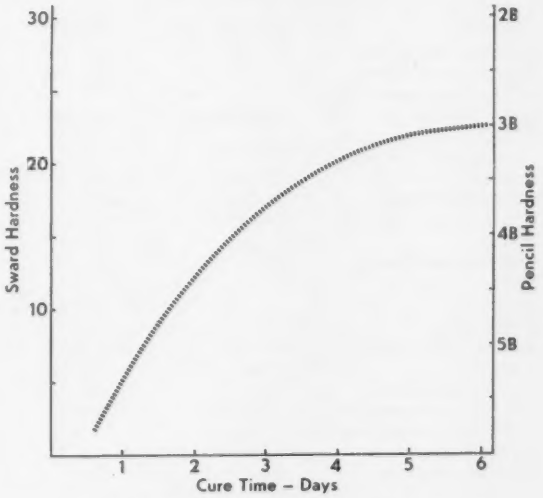


FIG. 4—Cure rate at room temperature.

blocking of the polymer chains, resulting in films with poor physical properties.

Several remaining factors of possibly lesser importance must be considered with respect to their influence on the cure of prepolymers. The first of these factors is the elastomer. Due to the infinite variety of compound ingredients, no set rule can be established but, in some cases, a retardation of cure is encountered with some stocks. This can be helped by increasing time or temperature of cure.

Cure rate of the coating also depends on film thickness, and practical upper limits of 2 to 3 mils per coat are suggested. It has been found that air-borne oven contaminants from other stocks cured at the same time may retard drying. If this occurs, the coated material should be cured separately. And lastly, the presence of large amounts of materials such as alcohols, amines, etc. in the air surrounding the curing film reduce the normal dry time and should be avoided.

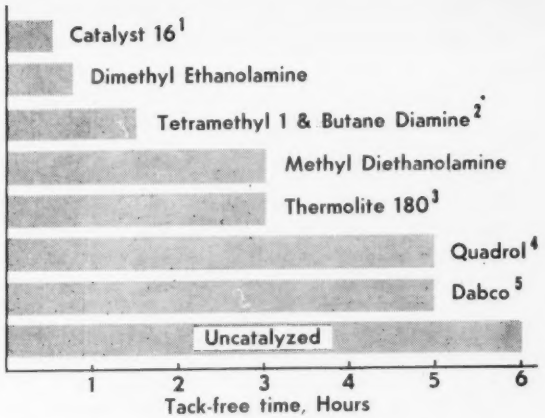
Uses and Performance

Elastomers are used in the production of a great number of items. These products are continually being subjected to deteriorating influences such as water immersion, abrasion, and contact with chemicals. It is quite difficult to economically formulate an elastomer compound which will have the desired mechanical properties, withstand all these conditions and, in addition, have the desirable features of low coefficient of friction or low temperature flexibility. The question of how to aid in keeping the original item in good condition after it has been in use is probably best answered, as with many other materials, by the use of a protective topcoat.

Many favorable properties, such as increased ozone, oil and chemical resistance, can be gained with a flexible urethane coating with elastic properties similar to those of the rubber compound itself. These can be attained while avoiding compound changes or adoption of substitute elastomers. Flexible urethane prepolymers are particularly applicable in those cases where an elastomer of inadequate resistance must be upgraded in performance for use under adverse environmental conditions. This need would arise in instances where substitution of a cheaper compound is desired. Table IV and Figure 6 illustrate the improved ozone resistance contributed by one mil of a flexible prepolymer coating. At the same time, use of a coating can help prevent stock staining or compounding ingredient migration. In addition, abrasion and mar resistance are improved.

Probably one of the most important features contributed by coatings on rubber is modification of surface characteristics. For example, in Table V, the marked reduction in elastomer coefficient of friction by coatings is shown. These features are generally most easily obtained by pigmented prepolymer coatings. Surface tack, gloss and coefficient of friction can be controlled, and the chance of dirt pick-up or contamination can be reduced.

Single-package flexible prepolymer urethanes,



(1) Mobay Chemical Co., Pittsburgh 1, Penna.
(2) N, N, N, N-tetramethyl — 1, 3-butanediamine. Union Carbide Chemicals Co., New York, N.Y.
(3) Metal & Thermit Chemical Co., Rahway, N.J.
(4) N,N,N',N'-tetrakis (2-hydroxylpropyl) ethylenedianiine, Wyandotte Chemicals Corp., Wyandotte, Mich.
(5) Triethylenediamine (0.2% on Non-Volatile). Houdry Process Chemical Corp., Philadelphia, Penna.

FIG. 5—The effect of catalysts on room temperature cure.

TABLE II—CATALYSTS

Material	Trade Name	Supplier
N-Methyl morpholine		
N-Ethyl morpholine		
N-(2-hydroxypropyl)-ethylene diamine	Monolene	Wyandotte
N,N,N',N'-tetrakis (2-hydroxypropyl) ethylene diamine	Quadrol	Wyandotte
Triethylenediamine	Dabco	Houdry
N,N-Dimethyl ethanolamine		
Methyldiethanolamine		
N,N,N,N-tetramethyl-1,3-butanediamine		Union Carbide
Triethylamine		
N,N'-Diethyl-2-methyl piperazine		
N-(2-hydroxypropyl)--Dimethyl morpholine		
N,N'-bis(2-hydroxypropyl)-2-methyl piperazine		
N,N-Diethyl cyclohexylamine		

TABLE III—SHELF STABILITY OF CATALYZED PREPOLYMERS

	Viscosity in Centipoises		
	Initial	20 Days	50 Days
Dimethylethanolamine	40	300	7650
Methyldiethanolamine	40	260	476
N-ethylmorpholine	40	140	350
N-methylmorpholine	40	120	303

FIG. 6—Upgrading SBR ozone resistance with one coat of prepolymer.

TABLE IV—ACCELERATED OZONE RESISTANCE TEST

Elastomer	Results: Uncoated Control	Results: One mil of Clear Prepolymer Coating
Natural Rubber	Severe attack in 1½ minutes	Negligible effect after 40 minutes
Styrene-Butadiene	Severe attack in 1½ minutes	Negligible effect after 40 minutes
Nitrile	Partial attack after 5 minutes	Negligible effect after 40 minutes
Chloroprene	Slight attack after 40 minutes	Negligible effect after 40 minutes
Butyl	Slight attack after 250 minutes	Negligible effect after 250 minutes

whether clear or pigmented, are unique in this field with their practical combination of features such as good all-round adhesion, no "unblocking" (see Figure 2, Equation 9), and short versatile cure cycles.

Based on these properties, a number of representative applications or industries are suggested for which these coatings are ideally suited. Among the wide variety of outlets, the automotive, sporting goods, toy, leather, medical, tile and textiles industries can be mentioned. Typical uses are for storage of rubber goods such as tires, protection of hoses and belts, coating of sponge rubber, coating fiberglass or rubber sheathed electrical wire and cable, etc.

Contribution of Polymer Structure

A discussion of urethane prepolymer coatings would not be complete without mention of the basis of their unique properties and also some consideration of influences on these properties in the various practical aspects of coating rubber. The characteristics of urethane coating polymers are different than other types presently being used because of the contributions of three main factors of their polymer structure. These are: chain orientation, the presence of strongly attractive groups along the chain, and the regular distribution of these groups.

For use as coatings, the structure of urethane polymers needs to be modified by the introduction of side groups along the chain in order to get solubility in common solvents. Aromatic rings are needed in the substantially linear chain backbone, however, to give a certain degree of rigidity without which a satisfactory tack-free cured film is difficult to obtain. Likewise, the presence of some chain crosslinking aids in solubility and, quite probably, elasticity.

One primary feature of urethanes resulting in their superior properties is the strong intermolecular force between chains resulting from hydrogen bonding. A list of several groups with respect to their contribution to the energy of intermolecular attraction (molar cohesion) has been given by C. W. Bunn *(6)*. This list (Table VI) shows the trend to higher attractive forces going from the relatively weak non-polar methyl group to the polar ether group to the urethane group which exhibits high molar cohesion due to hydrogen bonding.

An important consideration in this force is the closeness and linearity of the chains and their geometric "fit" as illustrated in Figure 7 with a polyamide. The practical effect of the various intermolecular forces is to give a coating film which displays properties equivalent to much higher molecular weight polymers. This is shown in characteristics such as high flexibility, elongation, abrasion resistance, etc.

Factors Influencing Adhesion

Unlike the coating of a rigid substrate, which is complicated enough in its own right, the factors involved in flexible coatings on rubber are probably so varied that each case must be considered individually. However, from a practical aspect, several basic fundamentals can be mentioned. Some of these are involved in the coating of substrates such as metals or wood, but others are peculiar to elastomeric substrates.

The adhesion of the coating to the substrate is of prime importance in any coating operation. Urethane

TABLE V—MODIFICATION OF COEFFICIENT OF FRICTION OF ELASTOMERS WITH COATINGS

Material	Slip Angle (degrees)	Coefficient of Friction
A. Uncoated Styrene-Butadiene Rubber (SBR)		
40 Durometer	59	1.664
50 Durometer	58	1.600
60 Durometer	49	1.150
70 Durometer	44	0.966
B. 40 Durometer SBR with One Mil of:—		
Clear, glossy prepolymer (50% elongation)	18	0.325
Clear, glossy prepolymer (150% elongation)	42	0.900
Clear, low-gloss prepolymer	26	0.488
Black, glossy prepolymer	48	1.100
Black, low gloss prepolymer	23	0.424

coatings have generally excellent adhesion to all common elastomers; however, at the present state of technology, adhesion to silicone rubber cannot be practically accomplished. When dealing with flexible coatings on rubber compounds other than silicone, adhesion is primarily a function of the elastomer itself, the elastomer compounding, the cure conditions, and the stock durometer.

Secondarily, the age of the film, the film thickness, and the method of application have a bearing. On certain elastomers, surface treatment *(7)* can be used to improve adhesion. This either takes the form of strong sulfuric acid treatment or halogen treatment of the surface. The most common type of the latter is use of a solution of sodium hypochlorite in water acidified with hydrochloric acid. In this treatment, which is effective at room temperature, the liberated chlorine acts on the surface of the rubber. Immersion times of one minute have been found to be effective for natural rubber, SBR, and neoprene. Silicone mold release agents on the surface of the rubber should be avoided since they make treatment difficult, if not impossible. Likewise, wax or oil interferes with good treatment.

Testing of Adhesion

Coating adhesion, aside from surface treatment, is greatly influenced by the composition of the stock. The presence of certain waxes, oils, plasticizers, and accelerators can be extremely harmful. However, tape adhesion tests have indicated that coating adhesion to rubber also varies with different elastomers.

Wm. M. DeCrease *(8)* has reported a Bondability Index in which he rates five common elastomers on a comparative adhesion basis, relative to their degree of bonding in a rubber-to-metal adhesion study. These ratings permit the assignment of relative values to these elastomers which indicate "bondability." The procedure used in this study was the conical method developed by Painter *(9)*. This method involves curing rubber between two specially designed metal cones which have been previously coated with adhesive, and pulling the completed assembly in a tensile tester.

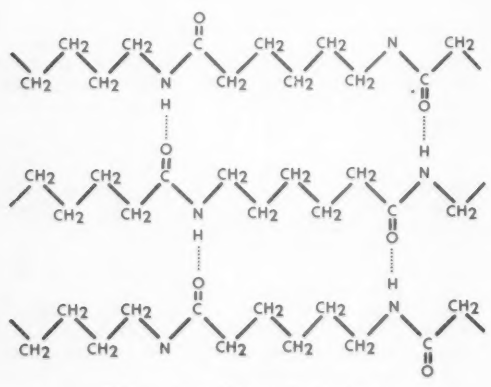


FIG. 7—Inter-chain "fit" of nylon 6.

TABLE VI—MOLAR COHESION ENERGY OF ORGANIC GROUPS

Functional Group		Cohesion cal./mole
Hydrocarbon	—CH_2—	680
Ether	—COC—	1000
Ester	—COO—	2900
Aromatic	—C_6H_5—	3900
Amide	—CONH—	8500
Urethane	—OCONH—	8740

Figure 8 illustrates the manner in which rubber is bonded to the conical specimens.

This new evaluation technique generally results in the desirable feature of failure at the bond interface. This forced interface failure gives test results which are more reproducible and show statistically close cluster among replicate samples. In this test, maximum values depend on the maximum tensile values of the rubber stock. Below this upper limit, the values obtained are a function of the adhesive.

By means of this technique, a number of conical specimens were prepared with various elastomers using clear and pigmented flexible urethane coatings as adhesives. Although bond strengths in the range of high strength rubber-to-metal adhesives were not obtained, the pull values definitely indicated varying degrees of adhesion with different elastomers. Neoprene and nitrile gave higher pull values with a general trend of lower values for butyl, SBR and natural. Although admittedly there is a difference between measuring adhesion of coatings to cured rubber and performance as rubber adhesives, it is felt that these bonding results may indicate a general relationship between the two. In addition, oven curing of flexible coatings on elastomers may be somewhat similar to conditions involved in bonding rubber to metal.

Testing of Elongation

The elongation of films is commonly measured with tensile testers such as the Instron, according to ASTM specification D-412-51T. These values are extremely helpful in characterizing polymers and arriving at an appreciation of their relationship to other film-forming materials. However, in determining the practical elongation of coatings, it is necessary to consider additional factors such as adhesion of the coating, film thickness, age of the film, and durometer of the stock.

The elastomer in flexible coating applications is the main limiting factor. As two examples, a high durometer stock which cannot be elongated more than 150 per cent, or a low tensile strength sponge rubber gasket, would generally not require a 300 per cent elongation coating. A simple, convenient method of determining the approximate elongation performance of a flexible coating film is to coat a sample of rubber about 6 by 1¼ by 1/10 inches; after an appropriate curing cycle, subject the sample to tensile testing at a jaw separation rate of 2 inches per minute. After

100 per cent elongation, the sample can be removed and examined for conditions such as cracking or loss of adhesion. If the elongation is carried to the point of coating failure (a point of failure which is a dual function of the elastomer and the coating) the test data can be quite helpful in indicating the effects of adhesion improving surface treatment, cure conditions, stock durometer, etc., on the flexible coating performance.

Values obtained by this method are only relative and should not be compared with other determinations unless only approximate correlations are desired. Use of standard elastomer formulas can aid in these comparisons if stock physicals, surface preparation, cure conditions, etc., are held reasonably constant. Coating dry film thickness ranges between samples should not vary excessively. A typical stressed specimen is shown in Figure 9.

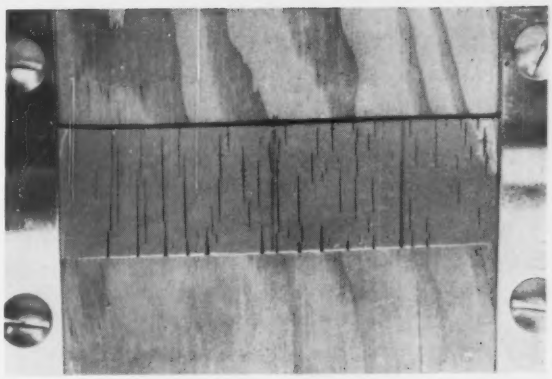


FIG. 9—Stressed specimen, failure at 300 per cent elongation.

Ozone Resistance

Two environmental conditions which are always brought up in a discussion of flexible rubber coatings are ozone and solvent exposure. Several points pertinent to each are worth noting. With respect to ozone resistance, which is probably the most serious destructive agent for rubber, a remarkable up-grading of resistance can be accomplished with a single one mil continuous coat of a clear or pigmented flexible urethane. This is even true of the more sensitive high unsaturation elastomers.

The use of antiozonants can bring the resistance of styrene-butadiene rubber close to that of unprotected neoprene. However, the mechanism of these antioxidant compounds is sacrificial and they are consumed during service. In addition to the use of additives, it is also known that certain aspects such as temperature, compounding, and the amount of stress are important in the degree of ozone attack although not to equal degrees.

It has been established (*10*) in the wire and cable industry that compounds developed with almost complete stress relaxation (low modulus) show improved ozone resistance. However, this results in stocks with very low tensile strength and high permanent set. These compounds, while being satisfactory for the wire industry, do not have suitable mechanical characteristics for other applications in the rubber industry.

In these other applications, one other elastomeric feature is important. This is that different polymers (of varying ozone resistance) have critical ranges of elongation and outside these ranges, the effects of ozone are greatly reduced. G. Maasen (*11*) lists the range for gum rubber at 5 to 25 per cent; SBR has a slightly higher minimum and a higher maximum than this. Butyl and neoprene have minimums of 65 per cent and 50 per cent, respectively. These figures point up the rather obvious importance of using a coating for ozone protection which forms a continuous flexible film and has inherently high ozone resistance itself.

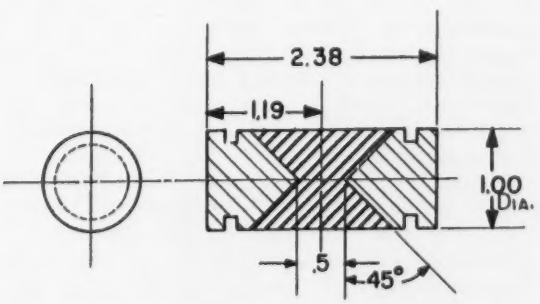


FIG. 8—Schematic diagram of bonding rubber-to-metal surface of test specimen.

Solvent Resistance

Protection against solvents is often required simultaneously with ozone protection. This double requirement is quite difficult to achieve with coatings which do not continue to cure to insolubility (cross-link) after they are applied. Solvent resistance of various elastomers varies quite widely and is a function of the solubility parameter concept as developed by H. Burrell (*12*) and others.

Solubility parameter is a numerical constant which is expressed as a single number for solvents and as a numerical range for polymers. For a solvent, the value is calculated from physical constants such as molecular weight, density, and boiling point. For polymers, the value is determined by exposing a cured film to a wide variety of solvents, and expressing the solubility parameter as the appropriate value of the solvents either dissolving or showing the highest swelling. The theoretical value for polymers may, however, be calculated from molecular structure. The range of the solubility parameter of a polymer is influenced by its degree of molar cohesion and varies from about ± 1.1 to 3.5.

Consideration of this theory allows approximate prediction of the effect of solvents on elastomers if one other condition introducted by Burrell is combined with solubility parameter. This is the effect of

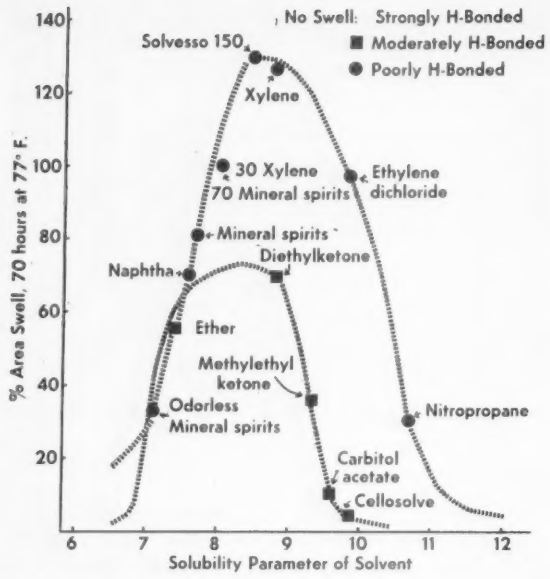


FIG. 10—Swell of SBR in solvents of varying hydrogen bonding capacity.

the hydrogen bonding capacity of solvents in which solvents are grouped into three classes, e.g., poorly, moderately, or strongly hydrogen bonded.

By exposing samples of an elastomer to selected solvents from all hydrogen bonded classes, and expressing the results as either weight gain or volume change, graphs can be constructed which indicate the solubility parameter range in each class and also the magnitude of the effect due to various classes. It should be noted that this range need not be the same in each solvent class. Where no effect is noted with one or more classes, the parameter is given as zero.

In a few cases, elastomers may show losses in weight due to extraction of plasticizer. This illustrates the difference in determining elastomer solubility parameter range and determining that of polymers such as urethanes, due to the variations not only in the elastomers themselves but in their compounding. This is undoubtedly one of the reasons for the wide variety of values reported in the literature for various elastomers. Figure 10 shows a solubility parameter graph of a 40 durometer SBR stock giving volume swell in various hydrogen-bonding classes.

Per Cent Swell

The per cent swell is reported as the change in area of the test specimens, a simplification which is felt to be justified since the shape of the curves as determined in separate volume increase methods is nearly identical. This graph shows the great difference in swell between poorly hydrogen bonded (H-bonded) solvents such as xylene and moderately H-bonded solvents such as diethyl ketone. Negligible swell was found with strongly H-bonded solvents like ethyl alcohol. Some of the strongly H-bonded solvents resulted in negative values, indicating possible oil or plasticizer extraction.

Aside from the effect of an extractable plasticizer, as mentioned above, swelling by solvents can be reduced by increasing the cure (*13*). Coating performance is improved by using greater film thickness and developing a high level of adhesion.

Although use of a protective urethane coating will definitely reduce solvent attack, the ultimate performance in long term continuous exposure will depend on the stock compounding and the solubility parameter of the solvent in relation to the solubility parameter of the rubber. Actually, for the ultimate in solvent resistance, the elastomer used should be chosen as far as possible from the solubility parameter of the solvent to which it is to be exposed.

Application Technique

Due to the curing mechanism of urethane coatings involving reaction with moisture from the air, certain simple precautions are necessary regardless of application. Most of the conventional procedures may be used with certain modifications. Any necessary thinning should be done with special anhydrous diluents.

In spraying, conventional, airless, or electrostatic equipment may be used, providing it is thoroughly dry. Air entering the pressure tank should be dried by passage over fresh dessicant, but atomizing air need not be dried.

Dip application of these moisture-sensitive prepolymers can be accomplished with certain simple precautions. These are: working volume is kept as small as possible so that the material is used up rapidly, low ambient humidity is maintained, and the open liquid area is blanketed with dry, inert gas.

Brush Application

With care, smooth coatings can be produced by brush application. The procedure is similar to dip application in that brushes and containers must be kept clean and dry. It is recommended that used coating be kept separate from fresh bulk material and not returned to original containers.

Multiple coats may be applied if proper drying time is permitted between coats. Since different application procedures result in varying degrees of solvent entrapment, no specific recommendations can be made. However, times between application and cure of roughly ten minutes are possible, and recoating can be accomplished after several hours. Some application methods result in higher film thicknesses than others but, in any case, dry films several mils thick may be applied.

Cleaning the stock of dirt and lint before it is coated aids in obtaining the optimum appearance of the coated elastomer parts. Likewise, a dust and lint-free drying atmosphere helps maintain the best appearance. In some cases, rubber stocks contain agglomerates which show up under stress. These particles can be mistaken for defects in the applied material, partic-

ularly with high gloss coatings. However, close examination will show them to be in the uncoated stock suggesting scrutiny of the compounding ingredients or process.

Summary

By the use of tailored prepolymers and novel techniques, single-package, clear or pigmented, high-flexibility coatings can be produced. These versatile materials, based on the new technology of urethane polymers, offer a number of advantages in rubber coating applications. They allow the use of elastomers in new fields and give cost advantages in cases where it is possible to substitute a less expensive elastomer.

In addition, improved performance can be obtained with elastomers which would otherwise be unsatisfactory by improving specific weak points. Among the many benefits to be obtained are uniform appearance and reduced staining, improved resistance to ozone, oils, chemicals, solvents, and abrasion; plus favorable modification of surface properties such as coefficient of friction and tack.

Illustrative physical properties of typical formulations show low viscosity at relatively high solids, good coverage, and excellent shelf life. Cure of the coating is accomplished by reaction of the polymer film with moisture in the air. Optimum film properties can be obtained at both room and bake temperatures. An unusual aspect of film conversion is the combined cure method using a partial oven cure followed by room temperature drying. Coating cure can be accelerated by the use of catalysts. Factors such as temperature and humidity are of major importance and the elastomer, film thickness, and atmosphere contamination need to be considered.

Urethane polymers owe their unique properties to their molecular architecture and the extremely wide variety of modifications possible in composition due to changes in ingredients. Adhesion of prepolymer coatings varies depending on the particular elastomer and its compounding. Rubber surface treatment and oven baking improve coating adhesion to rubber. Resistance of coated rubber to environmental factors such as ozone or solvent is greatly dependent on the properties of the elastomer itself, although all are upgraded to varying degrees by urethane coatings.

Prepolymer urethane coatings are moisture sensitive and thus require certain precautions during use. Conventional application methods may be used, however. Particular care is necessary to ensure a clean substrate.

The characteristics of these coatings on rubber suggest their use on other extensible or elastic substrates. In addition, they may also find utility on less flexible substrates due to their unique combination of toughness, flexibility and resistance properties.

Test Methods

(1) Viscosity; Brookfield Viscometer, Model LVF.

(2) Sward Hardness: *Official Digest*, Federation of Societies for Paint Technology, Vol. 26, pp. 1030-38 (1954).

(3) Pencil Hardness: *Ibid.*, Vol. 28, p. 232 (1956).

(4) Tensile Strength, per cent Elongation: ASTM D-412-51T, Die C, 20 inches per minute.

(5) Solvent Resistance: SBR rubber specimens, 1/10″ x 1″ x 2″, were totally immersed in solvents of varying solubility parameter for a period of 70 hours at 77° F. Measurements were made immediately upon removal of samples. In some cases, data are approximate due to solvent volatility.

(6) Dry Time: ASTM D-154-53, cotton method.

(7) Adhesion: Tape method, MIL-F-18264A (Aer.) Section 815 (modified).

(8) Adhesion: Conical method—Painter, G. W., *Rubber Age, Vol.* 86, No. 2, p. 262 (1959).

(9) Flash Point: Tag Closed Cup, ASTM D-56-56.

(10) Ozone Resistance Test: Modified ASTM D-518-57T. Measurements were made on flexed specimens of typical elastomers, with and without one coat of prepolymer cured for 5 minutes at 300° F. Exposure was to a dry stream of high ozone content air until a point was reached where severe attack was noted. At this time, the failed samples were removed and the test continued. The test was terminated after either 40 or 250 minutes.

(11) Coefficient of Friction: Sommerfeld, A., "Mechanics," Academic Press, New York, p. 81, 1952. Panels of SBR rubber with one coat of the indicated material, were cured for 5′ @ 300° F. A metal cylinder was placed lengthwise on the horizontal panel. One end of the panel was then raised until the cylinder just began to slip. The tangent of the angle of inclination is the coefficient of static friction.

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(1) Heiss, H. L., Saunders, J. H., Morris, M. R., Davis, B. R., and Hardy, E. E., *Ind. Eng. Chem.*, Vol. 46, p. 1948 (1954).

(2) Saunders, J. H., and Slocombe, R. J., *Chem. Rev.*, Vol. 43, p. 203 (1948).

(3) Bailey, M. E., Kirss, V., Spunburgh, R. G., *Ind. Eng. Chem.*, Vol. 48, p. 794 (1956).

(4) Alzner, B. G., and Frisch, K. C., *Ind. Eng. Chem.*, Vol. 51, p. 715 (1959).

(5) Trade name, Wyandotte Chemicals Corp.

(6) Bunn, C. W., *J. Polymer Sci.*, Vol. 16, p. 323 (1955).

(7) Thompson, D. C., "Mechanical Molded Goods," E. I. du Pont de Nemours & Co., Inc., p. 65, 1955.

(8) DeCrease, Wm. M., *Rubber Age*, Vol. 87, p. 1013 (1960).

(9) Painter, G. W., *Rubber Age*, Vol. 86, p. 262 (1959); *Adhesives Age*, Vol. 3, p. 36 (1960).

(10) Maasen, G. C., "Antioxidants and Waxes," Lecture VII, in A. J. DiMaggio, compiler, "Basic Rubber Technology Lectures," Villanova University, Philadelphia, 1955.

(11) Maasen, G. C., *Ibid.*

(12) Burrell, H., *Official Digest*, Vol. 27, p. 726 (1955); *Ibid.*, Vol. 29, p. 1159 (1957).

(13) Thompson, D. C., "Mechanical Molded Goods," E. I. du Pont de Nemours & Co., Inc., p. 98-99, 1955.

If you write technical reports . . .

Polish your Title and Abstract

SPECIAL INDUSTRY REPORT

By JOHN D. STEVENS *Washington State Institute of Technology Pullman, Washington*

► Right now, you are wondering if this article will be worth your time and effort to read. Does it contain any new ideas? Does it have to be read now, or can it go on the "one-of-these-days" stack?

Your reader asks the same questions when he picks up your technical report. He will base his answers on the title and the abstract. That's why you had better give those elements some careful consideration. If your report is not read, you are not communicating.

The popular writer—the novelist, the magazine writer, the newspaperman—knows he has to capture the reader's interest and then use every devise at his command to hold it. The first time you let up, he will be gone.

It is time technical writers acknowledged this. Many of them will spend months on the body and dash off the opening sections. Still, hundreds or even thousands, of readers are going to see the title and/or abstract for every one who wades through the entire report.

Abstracts are a reality of modern professional life. No one has time to read all he should, let alone what he would like. It would take one man 465 years to scan—not read—the 60 million pages of technical reports produced in the world during 1960. In 24 hours, enough are turned out to fill seven sets of the Encyclopedia Brittanica.

Abstracts are carried in three places: abstract journals, library index cards, and preceding many journal articles. In each place, they are scanned by many readers.

The typical scientist or engineer reads a handful of pet journals and relies on abstract journals to fill him in on material published in journals in his own and related fields, and to help him spot articles he should read in full.

These journals (and there are about 300 of them covering scientific fields now) do such a good job of summarizing significant results that it usually is not necessary for the reader to go through the entire report—unless he is particularly interested in details about procedures.

The Abstract

Write your abstract before you begin the body of your report. It will serve better than an outline to keep you within the bounds of your subject matter.

Benjamin Franklin reportedly finished a letter to a friend with the comment, "I hope you will excuse this long letter; I didn't have time to write a short one."

Concise writing is more difficult, but boiling down information—*in advance*—will help you when you write the full-length material.

Here is a formula for writing abstracts which may prove helpful.

State the problem in a single sentence. This will take some time and effort, but it is the key to the abstract and to the report. Make sure it really states the problem. Then start cutting down the sentence. Become a word miser. Imagine you are an editor with a terrific space shortage (because this is exactly the situation every editor faces). Is every word essential?

Once you get the subject sentence trimmed to the bone, write two or three more sentences expanding the explanation. Here you may be able to put back some material boiled out previously.

Now state your approach in a single sentence. Follow the procedure you used to state the problem. Cut the sentence; then write two or three more supporting statements. Then cut those.

Now you are ready to state the really significant results. Decide which results belong in the abstract. Seldom is there justification for listing more than one. Support it with a couple of sentences.

If you limit the abstract to 250 words (about one double-spaced typewritten page), you will be turning out really meaty abstracts—the only acceptable kind.

We propose a stiff test for any abstract. Hand just the abstract to two or three friends who have college degrees in other fields. After they have read it, ask them to tell you the problem in their own words; then, the approach; then, the significant results. They may not understand the formulas or the technical terms, but they should have some idea of what the report is about.

Technical writers must never forget that most of their readers are not experts on the subject. If they were they would be doing the writing. Most research reports are directed to management personnel who have little or no technical background. They basically are businessmen.

Writing the Title

Now, let's consider the title. The title should be complete and easy to understand. Above all else, it should identify the document. Conciseness is desirable.

Keep in mind that the report or article is going to be indexed and listed according to this title, so make sure the person (or machine) doing the filing *cannot* misfile it. If she (or it) does, the information is lost.

The title is more than a label. It should tell the reader something about the exact nature of the study, and if possible, it should suggest the findings. It should do all this in eight words or fewer.

For instance, "A Report on Some Aspects of Growth Factors in The Puerto Rican Rubber Industry", is about as bad a title as one could write. "Growth of the Puerto Rican Rubber Industry" tells the reader just as much in few words, but can be improved.

A good, strong verb almost always livens up a title. The active voice gives your title a sound of authority.

"Rubber Industry Triples in Puerto Rico" makes a positive statement, and gives the reader the gist of the findings.

Another good approach is the "How" title. This subject might be treated as, "How Puerto Rico Tripled Rubber Production." But before using the "How" title make sure your report answers the question!

There is no excuse for such musty-sounding terms as "A Report on," "Some Aspects of", or "Some Observations on." The reader can see it is a report, and he assumes it covers "aspects" and "observations."

The title is the key to the article or report. If it does not attract prospective readers, the rest of the report might as well not be there.

Once the title has attracted the reader, it is up to the abstract to hold him long enough to provide the really pertinent facts. If both parts do their job, the reader will know whether he needs to proceed.

Both the title and the abstract are worthy of the author's careful consideration. It is time technical report writers stopped doing these important elements as afterthoughts and started treating them as the really meaningful parts of the report.

EDITORIAL

Disposal — Another Problem

► According to press reports, the Justice Department has asked the Federal Bureau of Investigation to look into a sharp one-day rise in rubber futures trading which may have come from a leak in government information. Trading in rubber futures more than doubled on June 14—two days after representatives of five government agencies met to discuss disposal of some $250,000,000 of natural rubber from the U.S. stockpile. It was agreed at this session, the reports state, that the United States would sell stockpile rubber if the world price was at least 25¢ per pound. The United States has had an agreement with rubber producing countries for the past 22 months to sell from the stockpile only when the world price is above 30¢ a pound.

Obviously a change in the U.S. selling price would have great impact on the rubber market. Thousands of dollars could be made by anyone with inside information that the price of rubber was due to fall sharply in the near future. The Rubber Disposal Committee—with representatives from the State, Defense and Commerce Departments, the General Services Administration and the Office of Civil and Defense Mobilization—met in the afternoon of June 12. On June 14 there were 740 long tons of rubber futures traded on the New York Commodity Exchange, more than double the amount traded on the two previous days and more than double the average for the month.

Of the total, 580 long tons were promised for November delivery at an average price of 28¾¢ a pound. If the world price of rubber does drop by November, the June 14 seller would make a handsome profit indeed. On June 14 a "secret" stamp was placed on all interdepartmental correspondence dealing with rubber disposal.

This is rather a serious matter. What is involved is more than a question of quick profits. There are wide and varied political implications. In these delicate times it ill behooves the "quick profit" boys to jeopardize our relations with rubber producing nations of the Far East and, indeed, our friends in the Western alliance.

It may, of course, be necessary to adjust stockpile sales prices from time to time to meet economic realities. The ramifications of such moves must be thought out most carefully by all involved. We take no issue here with any price moves which may or may not be made. We do think, however, that the various government agencies and the various participating private groups should not be forced to labor in an atmosphere where anything other than the security and well-being of this country is considered. The offenders, if any there are, should be rooted out for the good of all concerned.

NEWS REPORTS
and industry activities

SEPTEMBER, 1961

General Gets Swedish Oil-Extended Patent

► General Tire & Rubber Co., Akron, Ohio, has received notification from the Swedish Patent Office of a decision allowing its pending application for a patent covering its high - Mooney oil - extended rubber development. The notification ended six years of waiting by General Tire, who applied for a Swedish patent in 1951 after filing one in the United States. General Tire was officially awarded the U. S. patent on December 15, 1960. The Swedish ruling is said to be an important victory to General Tire in its attempt to obtain world-wide protection on the oil-extended rubber process.

Dismisses Objections

In granting the patent to General Tire, the Swedish Patent Office dismissed the objections of three parties who opposed the award on the grounds "the invention was not patentable and that it was obvious in view of the prior art." After extensive proceedings, the Swedish Patent Office ruled:

"Contrary to general conception held by those skilled in the art, applicants (General Tire & Rubber Co.) have proved that the very tough synthetic rubber, plasticized only by large amounts of plasticizer, gives a tread - portion material of high quality.

"Thus the examination department finds that the invention, relative to a pneumatic tire, is new and that said invention has inventive merit as well as technical effect."

General Tire has on file in Cleveland, Ohio, Federal Court suits charging infringement of its U. S. patent against Goodyear Tire & Rubber Co. and the U. S. Rubber Co. Other suits are pending in Baltimore, Md., Federal Court involving the Firestone Tire & Rubber Co. and the McCreary Tire & Rubber Co.

Ford May Enter Tire Field

► There is widespread speculation in the trade that the Ford Motor Co. is about to re-establish its own tire factory. Behind these rumors is the company's recent purchase of the Autolite brand name and spark plug and battery production facilities from Autolite. Spark plugs previously had been purchased from Champion, and batteries from several producers. In addition, there have been reports that Ford looked into the possibility of purchasing the Dayton tire manufacturing plant before it was acquired by Firestone. Before World War II, Ford was the only automobile producer to manufacture its own tires in a new, specially-built plant. Then, at the beginning of World War II, all the machinery was shipped to Russia under lend-lease.

Develops Champion Tire

► Firestone Tire & Rubber Co., Akron, Ohio, has developed a new economy-priced Champion passenger tire incorporating a precision-bladed tread design. The design features four ribs of "S" shaped tread bars arranged in a rope-like pattern around the tire. It is similar to the original equipment tire tread design developed by Firestone for new automobiles. Chief advantages of the bladed tread design, according to the company, are more non-skid edges and skid resisters which provide improved road grip for greater traction. The new Champion will come in a full range of sizes in black or white sidewalls. It will be available in tubeless construction with a nylon cord body or in a tube-type with nylon or rayon cord bodies.

Columbian To Merge With Cities Service

► A proposed merger of Columbian Carbon Co. and Cities Service Co. through a pooling of interests was approved on August 24 by the directors of both companies. The merger, subject to approval by stockholders of both companies and the appropriate regulatory agencies, is said to represent an important step forward in the diversification programs of each company. Through the merger, Columbian Carbon would benefit by having access to Cities Service's production of natural gas from which carbon black is derived, and Cities Service would add carbon black to its chemical products line in addition to acquiring additional oil and gas reserves. Each company will continue to carry on its principal activities with present management and personnel, the companies stated.

Merger Provisions

The merger proposal provides that stockholders of Columbian Carbon will receive, for each share of their stock, sixty-seven one hundredths of one share of no par value, cumulative convertible preferred stock to be issued by Cities Service. The preferred stock will carry a dividend of $4.40 per share and will be non-callable for five years. It will be convertible into Cities Service common stock on the basis of one share of preferred stock for each one and sixty-three one hundredths shares of Cities Service common stock. The new preferred stock will have voting rights and other conventional provisions. It may be redeemed after five years from its date of issue at a price of $105 per share on a declining basis.

Columbian Carbon's assets in 1960 totaled $89 million, while Cities Service, a major integrated oil company, has assets of more than $1.3 billion.

Firestone to Operate Brazilian Rubber Unit

► Firestone Tire & Rubber Co. will operate a new polybutadiene rubber plant which will be constructed at Recife, Brazil, by an agency of the Brazilian government. The Recife facility, said to be the first of its kind in South America, is being erected as part of an industrial development program for northeastern Brazil. The plant will have an annual capacity of 27,500 metric tons (2,205 pounds) of polybutadiene. Alcohol, needed for the production of butadiene, the principal ingredient in polybutadiene rubber, will be derived from the vast sugar cane fields around Recife. Construction will begin this Fall and will be completed in approximately two years, according to Firestone.

The Recife plant will be the third in which Firestone will manufacture polybutadiene. A unit at Orange, Texas, went on stream last Spring with an annual capacity of 30,000 long tons (2,240 pounds), and production is scheduled to begin in a new plant at Port Jerome, France, late this year.

Firestone has been active in Brazil since opening a tire plant near Sao Paulo in 1939. Facilities for the production of textiles and foam rubber have since been added to the plant. In 1956, the company established a 22,000 acre rubber plantation near Itubera in the eastern section of Brazil.

The new plant will be constructed by the Lummus Co., New York, N. Y., a subsidiary of Combustion Engineering, Inc.

Stephens Promoted

► Ben M. Stephens, formerly manager of the Goodyear Tire & Rubber Co. plant in St. Marys, Ohio, has been promoted to director of industrial products production. He will be located at the main plant in Akron, Ohio, and will head industrial rubber goods production at 11 plants in eight states. Mr. Stephens succeeds James E. Stafford, who has retired. A graduate of the University of Iowa, Mr. Stephens joined Goodyear at Aurora, Ill. following his graduation in 1939. In 1955, he became manager of the V-belt plant at Lincoln, Neb. and four years later was named manager of the molded and extruded rubber goods unit at St. Marys.

H. P. Schrank

J. P. Seiberling

Elected President of Seiberling

► H. P. Schrank, previously executive vice-president of the Seiberling Rubber Co., Akron, Ohio, has been elected president of the company succeeding J. P. Seiberling, who retired as president on August 31. Mr. Seiberling, chief executive officer of the company for more than half of its 40-year history, will continue to serve as chairman of the board of directors.

The new president joined Seiberling in 1926 as a tire engineer, after graduation from the University of Akron and post graduate work at the University of Wisconsin. He later served as foreign plant specialist and factory superintendent, and was elected vice-president in charge of production in 1936. After completion of the Harvard Advanced Management Program in 1956, Mr. Schrank was elected executive vice-president.

Mr. Schrank has been a Seiberling director since 1937. He also is a director of the firm's subsidiary in Toronto, Seiberling Rubber Co. of Canada, Ltd., and he is a vice-president and director of the Copolymer Rubber & Chemical Corp., Baton Rouge, La., which is partly-owned by Seiberling. A member of the board of directors of the University of Akron since 1946, Mr. Schrank was elected chairman of that group this year.

Mr. Seiberling, 63, had been president of the company since 1938, when he succeeded his father, F. A. Seiberling, who founded the company in 1921. Mr. Schrank thus becomes the third head of the firm.

In announcing his retirement, Mr. Seiberling said, "I have decided that a program we are embarking on to streamline operations and strengthen the organization should be accelerated. Therefore I am acting now, with this move at the top, on plans we have had to realign managerial responsibilities."

Goodrich Names Three

► B. F. Goodrich Co. has announced three appointments to the technical staff of its Research Center in Brecksville, Ohio. Frank J. Donat and E. Timothy McDonel have been named senior research chemists, and Bartolomeo DiLiddo has been appointed senior research engineer. Mr. Donat received his Ph.D. degree in organic chemistry from Case Institute of Technology in 1959. He joined Goodrich that year as a research chemist. Mr. McDonel taught basic research at Case Institute of Technology for five years before joining the research center staff as a research chemist in 1959. He received his Ph.D. degree in organic chemistry from Case in 1960. Mr. DiLiddo joined Goodrich in 1956 as a research engineer. He received his Ph.D. degree in chemical engineering in 1960 from Case while on leave of absence from the company to complete work toward the degree.

C.I.C. Rubber Division Holds Annual Conference

► The Division of Rubber Chemistry of the Chemical Institute of Canada held its Annual Conference on August 4, 1961, at the Queen Elizabeth Hotel, Montreal, during the 44th Canadian Chemical Conference of the Chemical Institute of Canada, held on August 2 to 5.

The main feature of the Rubber Division's one-day conference was a symposium on "Textiles as Applied to the Rubber Industry," at which four papers were presented. They were: "Nylon Yarns and Fabrics in Industrial Applications" by A. R. Szewczyk (DuPont of Canada); "Cotton" by D. James (Cosmos Imperial Mills); "Terylene Polyester Fibre and its Application in the Rubber Industry" by John S. Little (Canadian Industries); and "Rayon in the Rubber Industry" by Mark Abbott (Courtaulds Canada). J. J. M. Campbell (Northern Electric), chairman of the Quebec Rubber & Plastics Group, served as chairman and moderator of this symposium.

To round out the technical program, four additional papers in other areas of rubber technology were presented. They were: "Improving the Ozone Resistance of Nitrile Rubber" by W. J. Abrams (Polymer Corp.); "Some Unusual Properties of *Cis*-Polybutadiene" by E. W. Madge (Dunlop, England); "Lignin as a Reinforcement for SBR in Military Pattern Tires" by T. R. Griffith (National Research Council, Ottawa), D. W. MacGregor (Bauer Bros.), and Lloyd Krichew (Army Development Establishment, Ottawa), who presented the paper; and "Progress in Pneumatic Tire Vulcanization" by G. D. Stevens (Goodyear of Canada). D. G. Seymour (Cabot Carbon of Canada), chairman of the Ontario Rubber Group, served as chairman and moderator of this technical session.

In addition to the technical program, the Rubber Division sponsored a luncheon at which M. F. Anderson, president of the Dominion Rubber Co., was guest speaker. Mr. Anderson's talk was on "Modern Trends in the Rubber Industry." He remarked that the rubber industry is an essential one in the Canadian economy and it must prosper. According to Mr. Anderson, the value of production by all producers of rubber products in Canada is expected to increase from a level of $322 million in 1955 to some $505 million by 1965 and $620 million by 1970. The rubber company president pointed out that there are over 80 rubber manufacturing establishments in Canada, employing over 21,000 people.

Tire Production Up

Mr. Anderson stated that production of tires has increased from 3,275,000 units in 1940 to 7,845,000 units in 1955. In addition, the volume of miscellaneous rubber products has increased from $21,900,000 in 1940 to $114,000,000 in 1955. According to the speaker, assuming that the past relationship of 1.2 per cent of the Gross National Product remains stable, it is reasonable to expect an increase in the value of rubber products in Canada from the $222 million of 1955 to some $505 million by 1965 and $620 million by 1970. Mr. Anderson also discussed the problems of the rubber footwear industry, and presented some highlights in polymer chemistry that appear to be emerging from the laboratory stage.

At the symposium on textiles, the first speaker, Mr. Szewczyk, discussed nylon applications to various industrial products, with particular reference to the properties of nylon yarns and fabrics which result in better performing industrial products. Some of the applications covered dealt with tires, conveyor belts, ropes, fish nets, and other products utilizing coated fabrics.

The next speaker, Mr. Little, in his remarks on Terylene, explained that the collective properties of this drawn fiber make it a logical candidate for consideration as the reinforcement in certain rubber products, such as V-belts, conveyor belts, and tires. According to the speaker, textile fibers for use in such products require: the strength to resist an applied load; flexibility and maintenance of strength under service conditions; heat and chemical resistance; dimensional stability; and good adhesion to rubber. Mr. Little explained how well Terylene fulfills these requirements, and referred to work now underway to establish the suitability of Terylene for a number of specific applications.

Dr. Abbott, the final symposium speaker, discussed the properties of high tenacity yarns and compared them with those of other major industrial fibers. He pointed out that these properties are related to the requirements of a reinforced textile in rubber products such as tires, conveyor belts, transmission belts, and reinforced hose. Dr. Abbott also discussed the improvements in the properties of rayon and corresponding developments in tire con-

J. J. M. Campbell (Northern Electric), on left, chairman of the symposium on "Textiles as Applied to the Rubber Industry," discusses the program with the panelists, left to right: A. R. Szewczyk (DuPont of Canada), D. James (Cosmos Imperial Mills), J. S. Little (Canadian Industries), and Dr. Mark Abbott (Courtaulds Canada).

struction over the last few years, and presented data on reduced-ply tires.

In his discussion on the use of cotton in the rubber industry, Mr. James covered pneumatic tires, rubber footwear, rubber coated fabrics, and mechanical rubber goods. According to the speaker, mechanical rubber goods accounts for the largest amount of cotton used in the rubber industry, and cotton's use in rubber footwear continues to grow. He pointed out that the use of cotton in tires has declined to the point where it is estimated that less than 1 per cent of all fiber consumption is now cotton. He added that in rubber coated fabrics, another downward trend in the use of cotton is indicated.

At the general technical session, Mr. Abrams stated that the marriage of nitrile synthetic rubber with polyvinyl chloride plastics has led to an improved rubber to withstand severe environmental conditions. He pointed out that until this new development, nitrile rubber could resist oils, fuels, and solvents, but could only poorly resist sunlight and ozone. The speaker described the characteristics of this new nitrile rubber in its various proportions. He stated that by proper choice of nitrile rubber, polyvinyl chloride, and blending conditions, a rubber can be tailor-made to suit different environmental conditions.

The following speaker, Dr. Madge, remarked that the *cis*-polybutadiene synthetic rubber combines the good properties of natural rubber and regular synthetic rubber and promises to become of considerable importance. He pointed out that a major task of the polymer chemist and physicist is to relate the behavior of the product to its basic structure. Dr. Madge described the unusual behavior of *cis*-polybutadiene rubbers in regard to their electrical, flow and strength properties, wear, and carbon black interaction, and suggested reasons for the behavior.

Alex Jaychuk (Goodyear of Canada), left, immediate past-chairman of the CIC Rubber Division, discusses the luncheon program with the guest speaker M. F. Anderson, president of the Dominion Rubber Co.

D. G. Seymour (Cabot Carbon of Canada), on left, chairman of the general technician session, discusses the program with the technical speakers, left to right: G. D. Stevens (Goodyear of Canada), Lloyd Kirchew (Army Development Establishment), Dr. E. W. Madge (Dunlop, England), and W. J. Abrams (Polymer Corp.).

Mr. Krichew, the next speaker, reported on the use of lignin, a waste product of pulp mills, to produce a quantity of 11.00 x 20/12-ply rated nylon cord military tires, using conventional rubber processing equipment. According to Mr. Krichew, this is the only conventional aspect of these tires aside from the dimensions. He explained that the compounds in the carcass and tread are most unconventional, using no carbon black and only 12 per cent natural rubber. According to Mr. Krichew, these lignin tires were road tested and compared with conventional tires under controlled test conditions. After being subjected to 15,000 miles, the lignin tires gave equivalent tread wear, however the cutting and chunking resistance was not comparable to the control tires and the researchers are studying means for improving this equipment.

The final speaker, Mr. Stevens, reviewed the progress that has been made not only in types of equipment used for vulcanization but also the procedures. He pointed out that during the past 30 years the time required per unit for tire vulcanization has been reduced from 105 minutes to less than 18 minutes while the tire size cross-section has increased from 4.75 to 7.50 inches. According to Mr. Stevens, high temperature and short time cycle tire vulcanization is essential to obtain maximum efficiency with minimum capital expenditure to meet the continually expanding range of sizes and types of tires required in today's market.

E. R. Rowzee, president and managing director of the Polymer Corp., Ltd., Sarnia, Ontario, in an address to the Chemical Institute of Canada on August 3, emphasized the need for those companies hoping to enter the export field to determine at close range the potential opportunities for their products. Dr. Rowzee reviewed briefly the conclusions reached by the Canadian Trade Mission that visited the European Common Market last year. It was observed that a high degree of cooperation and understanding existed between management, labor, and government, which worked to good effect for the economic community.

He pointed out that western European countries had been forced to adopt this approach following the war. He mentioned that the general business atmosphere in Canada has not been conducive to this type of cooperation in the past. The members of the Mission felt that using the European experience as a guide could be a vital factor in improving Canada's own competitive position in domestic and export markets.

According to Dr. Rowzee, this basis of constructive and cooperative effort is not a substitute for initiative, efficient management, imagination, and resourcefulness on the part of the manufacturer, but will help to create the best atmosphere for a better economy for the benefit of all segments involved. Before making these observations, Dr. Rowzee reviewed the chain of events in Polymer's international operations, indicating the many links that had been forged over the past 19 years.

Rubber Trade Up With Soviet Bloc

► According to published reports, the volume of American goods licensed by the U. S. Department of Commerce for shipment to Soviet Bloc countries increased by more than 800 per cent in the three weeks following President Kennedy's July 25 address to the nation on the Berlin crisis. During this period the licensing total reached $6,278,566, compared with the previous three weeks' figure of $750,196.

Of the $6,278,566 total, licenses were authorized for shipping $1.7 million of synthetic rubber to Russia, Poland, Hungary, and Romania, as well as $38,000 of carbon black to Czechoslovakia. In the period between April and June, of the approved licenses, nearly 75 per cent, or $8,254,173, involved the Soviet Union. Chemicals and plastics accounted for $4,933,492, of which $2,425,502 was synthetic rubber.

The Department of Commerce ruled that none of these proposed shipments would endanger national security. Export regulations prohibit shipments to Iron Curtain countries of goods calculated to increase their war-making potential. Commenting on the situation, Secretary of Commerce Luther H. Hodges said that new restrictions on such trade were possible but "we must keep flexible the whole question of relationships."

Discusses Soviet Trade

The Commerce Secretary met several times in August with Secretary of State Dean Rusk to discuss trade with the Soviet Bloc. As a result of these meetings, licensing officials have been told to take a harder look at proposed exports to Iron Curtain Countries. Some members of Congress favor legislation to heavily restrain East-West trade. However, Messrs. Rusk and Hodges believe the same objective can be achieved through administrative discretion, thus avoiding a statement of national policy that might make the Berlin negotiations more difficult. It might be noted that the granting of a license does not mean that the goods will be shipped.

► "Mistron Vapor in Cross-Linked Polyethylene," Rubber Report No. 35, describes the reinforcing white pigment of the Sierra Talc Co., South Pasadena, Calif.

J. H. Rines

In New Pitt-Consol Post

► Pitt-Consol Chemical Co., Newark, N. J., has promoted J. H. Rines to the post of general manager of sales. He had been serving as manager of rubber chemical sales. The company also announced the appointment of R. J. Reale as manager of cresylic acid sales. Mr. Rines, prior to joining Pitt-Consol in 1956, held both technical and managerial posts at the B. F. Goodrich Co., Flintkote Co., Pioneer Latex Co., and other firms in the rubber and chemical fields. Mr. Reale, a graduate of Notre Dame with a B.S. degree in chemistry, previously served Pitt-Consol as a technical sales representative. Prior to joining the company, he was associated with the Allied Chemical Corp.

Inner Shield Tire

► Giant nylon cords are being used in the new Double Eagle premium tire of the Goodyear Tire & Rubber Co., Akron, Ohio. The tire is designed for use with an independently inflated inner shield which, according to the company, provides the safety of a "tire within a tire" and virtually eliminates the roadside flat. The Captive Air Safety Shield that fits within the regular tires is made of two partial plies of tempered steel and two plies of tough, durable nylon. If, for any reason, the outer tire should fail, the motorist can continue driving at normal speed for 100 miles or more. Use of the larger nylon cords results in a more durable auto tire body, the company states, as well as a lighter tire and a smoother ride.

French Rubber Institute Plans Paris Conference

► An International Rubber Conference, to be held from May 14 to May 18, 1962 in Paris, France, is being organized by the Institut Francais du Caoutchouc, under the sponsorship of the International Rubber Research and Development Board.

The purpose of the conference is twofold: to examine the latest scientific advances which have been made in the productivity and quality of natural rubber; and to analyze natural and synthetic rubbers in current use. The I.F.C. has established a program for exchange of information among the members of the various Institutes of the IRRDB, and plenary conferences have been arranged for further examination of current knowledge.

The Conference will be divided into six sessions: (1) Rubber in the World Economy; (2) Advances in Production and Knowledge of Natural Crude Rubber; (3) Developments in the Physics and Chemistry of Natural Rubber; (4) Improvements in the Qualities of Natural Rubber and the Natural Specialty Rubbers; (5 and 6) Comparative Analysis of Natural Rubber and the Main Types of General Purpose Synthetic Rubbers. A panel discussion will follow. The Paris conference precedes the Institution of the Rubber Industry's 4th International Rubber Technology Conference, to be held on May 22 to 25 in London, England.

Charter Flight Available

The ACS Rubber Division has approved the chartering of a flight to Europe for use by interested parties who wish to attend the Paris and London meetings. Details on the charter flight can be obtained from M. E. Lerner, RUBBER AGE, 101 West 31st St., New York 1, N. Y.

Deisz Named by Shell

► Dr. Marvin A. Deisz has been appointed a supervisor of research for the Shell Development Co., Emeryville, Calif. In his new capacity, he will head a group engaged in exploratory product development and product applications research in the Elastomer Research Department. Dr. Deisz is a graduate of the University of Akron, where he received his B.S., M.S. and Ph.D. degrees in chemistry. He joined the firm's research staff three years ago as a chemist.

U.S. Rubber May Close Striking Passaic Unit

► About 2,100 employes, at Passaic, N. J., of the U. S. Rubber Co. went out on strike on August 16 when members of Local 217 of the United Rubber Workers Union rejected a company offer for a new contract involving a change in the method of payment for idle time. U. S. Rubber told the striking workers that it would keep the facility going only as long as the operation remains competitive. According to the company, the Passaic operation was not profitable in 1960, and it must reduce costs to keep the operation competitive at its present location. The URW stated that the company's proposal would mean a pay cut of $10 to $15 weekly for incentive-plan workers.

U. S. Rubber said in a formal statement: "The company regrets the action of the union in calling the strike because of its serious effects on the economy of the community, the loss of earnings to its employes, and the reduction of service and deliveries to its customers." The statement also said that if U. S. Rubber's contract proposal were accepted, the company would remain in Passaic to try to keep the operation going on a competitive basis. According to the company, it had a loss of $2 million last year on its Passaic operation. The facility produces hoses, matting for carpets, mechanical packings, molded and extruded goods, oil field specialties, and other rubber products.

Stalwart Rejects URW

Employes of the Stalwart Rubber Co., Bedford, Ohio, have rejected the bid of the United Rubber Workers Union to represent them. In an election conducted by the National Labor Relations Board on August 9, the Stalwart employes voted 105 to 55 against the URW bid. It was the fifth time in 11 years that Stalwart employes have rejected URW representation. Stalwart Rubber produces mechanical goods.

Opens Belgian Office

► The International Institute of Synthetic Rubber Producers, with headquarters in New York City, has established a European office at 32, rue Joseph 11, Bruxelles 4, Belgium. Founded in 1960, the Institute now has 16 member companies in Europe, Japan, and North America.

M. M. Heywood

L. R. G. Treloar

IRI Awards Two Medals

► The Institution of the Rubber Industry, London, England, has presented its highest award, the Colwyn Medal, to Dr. L. R. G. Treloar, of the Shirley Institute, Manchester, England, and its Hancock Medal to M. M. Heywood, director of P. B. Cow & Co., Ltd., London. Dr. Treloar, one of the leading authorities on rubber physics, received the Colwyn Medal for his outstanding contributions to the knowledge of rubberlike elasticity and his researches on the elastic behavior of high polymeric materials. The Hancock Medal was presented to Mr. Heywood for his outstanding services to the IRI and the rubber industry.

Dr. Treloar was associated with the British Rubber Producers' Research Association from 1938 to 1949 as senior physicist, and since 1949 has occupied a similar post at the Cotton Silk and Man-Made Fibres Research Association (previously the British Rayon Research Association). From 1953 to 1955, Dr. Treloar was president of the British Society of Rheology. He is the author of some 50 papers and publications on rubber physics, and his book "The Physics of Rubber Elasticity" is said to be the standard work on the subject.

Mr. Heywood has an international reputation as a rubber technologist, and has been connected with the industry for more than 40 years. He was one of the founder governors of the National College of Rubber Technology, and is a member of many professional institutions, and a Fellow of the Royal Institute of Chemistry and the Institution of the Rubber Industry. He is a council member of the IRI, and has served on the education and other committees.

Hercules Names George

► Dr. Richard Stanley George has been named director of sales of organic chemicals for the Synthetics Department of the Hercules Powder Co., Wilmington, Del. Dr. George received his B.S. degree in chemistry at Grove City College. He served as an analytical chemist for the Jones and Laughlin Steel Co., as a chemist for the Sun Oil Co., and as a research chemist for Socony Vacuum Oil Co., before resuming studies for his Ph.D. He obtained his doctorate in 1943 from Penn State University, having held two fellowships. He then joined Hercules as a research chemist, and held several supervisory positions before being named associate technical director of the Wilmington research center in 1951. In 1954, he was named director of development for the Naval Stores Department, and has been manager of that department's Oxychemicals Division since 1955.

New York Group Holds Golf Outing

► The New York Rubber Group held its Annual Golf Outing on August 10, 1961 at both the Scotch Plains Country Club, Scotch Plains, N. J., and the Echo Lake Country Club, Westfield, N. J. It was the first time the group has used two courses for its golf outing, and both were divided between 229 golfers. The banquet, held at the Scotch Plains Country Club, was attended by 257 members and guests.

The Nesbitt Cup for Low Gross was won by West Curtis (Naugatuck Chemical) with a 75. This was the third time Mr. Curtis has won the Nesbitt Cup, and he now has retired the trophy from competition. Richard Stimet (United Carbon) also scored a low gross of 75, but was ranked second on a match of cards. Third low gross went to H. P. Pryor (R. E. Carroll) with a 76.

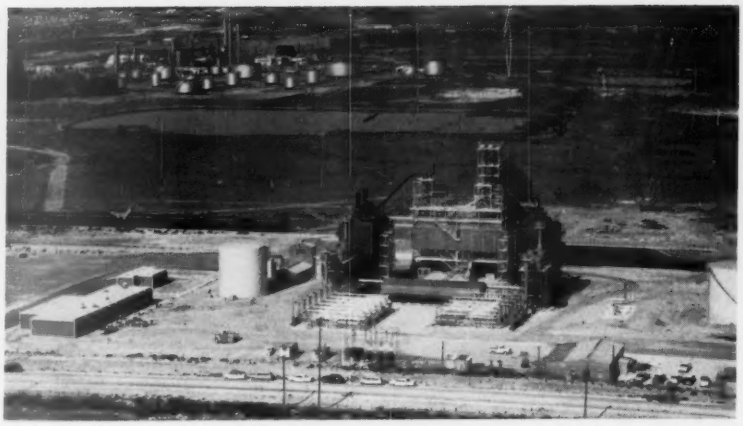
Other prize winners were: *High Gross*, A. W. Bull (U. S. Rubber); *Closest to Pin — Echo Lake*, H. Smith (Brunswick Rubber) and P. Kwiatanowski (Johns-Manville), *Scotch Plains*, E. Sutton (British Anchor Chemical) and A. Puschin (Kenrich Petrochemicals); *Longest Drive—Echo Lake*, W. B. Curtis (Naugatuck Chemical) and R. Stimets (United Carbon), *Scotch Plains*, R. Snedeker and R. Finn; *Putting Contest*, a tie between R. Graff (DuPont) and A. Puschin (Kenrich Petrochemical);

Kickers, F. Pechal, G. Stutz (New Jersey Zinc), S. Horesta, R. Strauss (National Polychemicals), I. Lightbrown (Enjay), J. Fielding (Armstrong Rubber), L. MacDonald (Allied Chemical), R. Lyons, G. Sella (American Cyanamid), W. Brackett (Okonite), J. Young; *Eagle*, R. Finn;

Birdies, M. Saint John (Columbia Cable & Electric), M. Hoffman (C. K. Williams), J. Callan (Columbian Carbon), W. Hess (Columbian Carbon), F. Young (Farrell-Birmingham), B. Royal, W. LaMont, B. Topcik (Eberhard Faber), W. Huether (Witco Chemical), R. Daly (Columbian Carbon), G. Stutz (New Jersey Zinc), E. Sutton (British Anchor Chemical), O. Adamson, A. Lefelar (Clifton Adhesive), W. Ramig, G. Donovan, T. Wlasuk, G. Rudeau (Whittaker, Clark & Daniels), M. Perfer (Enjay), T. Relevan, L. Dete (Carlisle Tire), A. Bald (Pittsburgh Plate Glass), T. Loser (Wyrough & Loser), R. Stimets (United Carbon), G. Sella (American Cyanamid), J. Priory (Lawrence Hose), J. Shaw (Lee Rubber), N. Fedun, W. Curtis (Naugatuck Chemical), R. Hendriksen (Phillips Chemical), J. Mills, H. Pryor (R. E. Carroll), J. Laibe (Enjay), H. Smith (Brunswick Rubber), J. Young, J. Baymiller, and M. Tukdarian (Pantasote).

H. A. Woodward (DuPont) and W. R. Hartmann (Laurie Rubber) served as co-chairmen of the Golf Outing Committee. Other committee members included: H. E. Chester (C. P. Hall), M. A. Durakis (General Cable), T. J. Farley (R. T. Vanderbilt), P. H. Wilhelm (United Carbon), and R. S. Walker *(Rubber World)*.

► Atlas Powder Co., Wilmington, Del., has changed its corporate name to Atlas Chemical Industries, Inc.



Aerial view of the new, automated Big Spring, Texas, furnace black plant of the Sid Richardson Carbon Co. The HAF and ISAF reactors are in the center foreground. The building at the extreme left houses the plant's modern laboratory facilities as well as the offices.

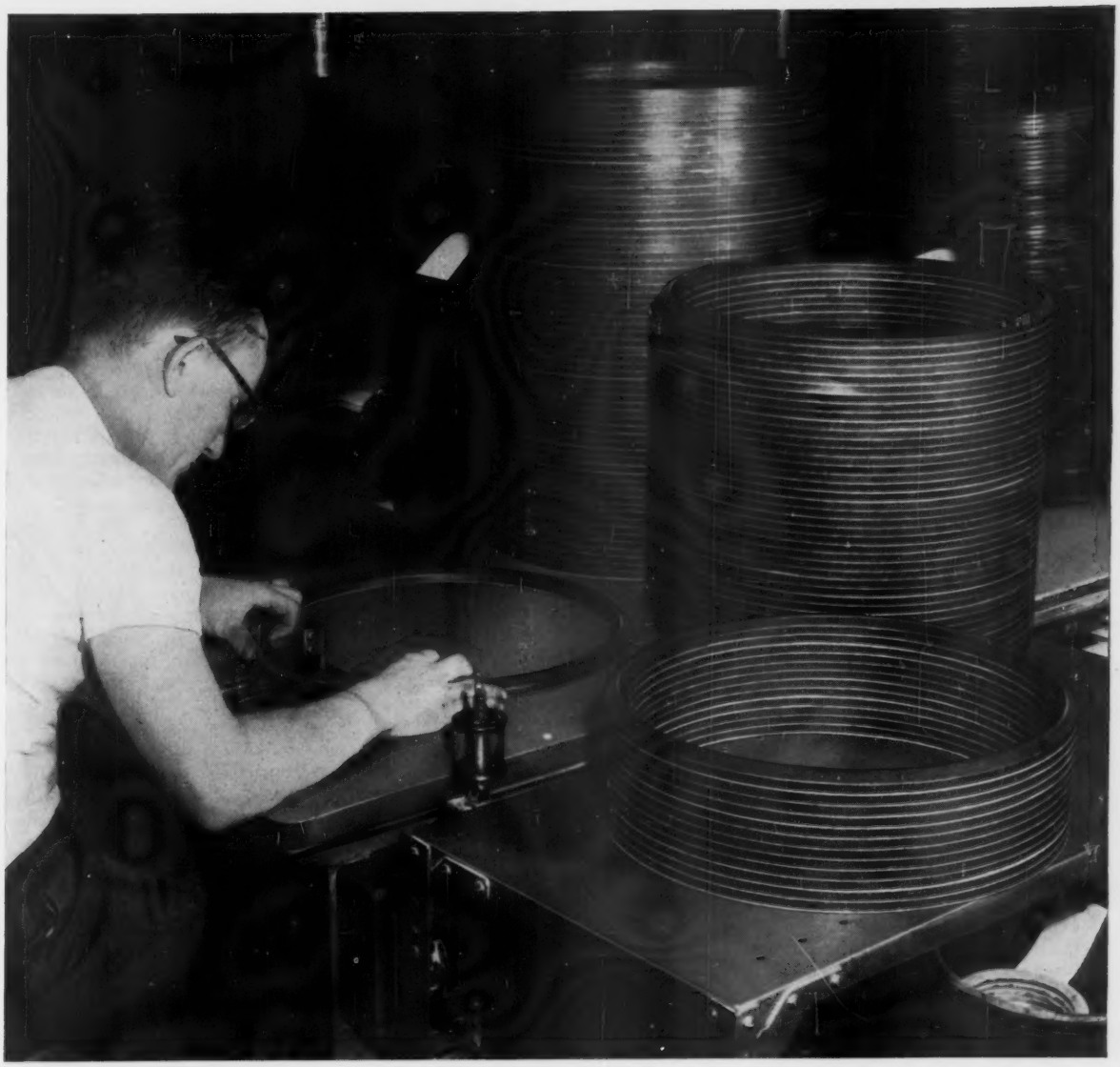
Sid Richardson Unit On Stream

► Sid Richardson Carbon Co., Fort Worth, Texas, has put its first furnace black plant on stream in Big Spring, Texas. The new, automated facility has an annual capacity of 60 million pounds of carbon black of the HAF and ISAF varieties, which are being produced under licenses of the United Carbon Co. The plant has a storage capacity for 4,500,000 pounds of carbon black. The Big Spring plant is located adjacent to the refinery of the Cosden Petroleum Corp. Cosden provides the feedstock from which the carbon is extracted.

Claiming that the facility is the most fully automated carbon black plant in the industry, Sid Richardson scientists point to the completely automatic control that is maintained on the oil, air, gas, and furnace temperatures. Even atmospheric changes are compensated for by means of highly sensitive control equipment. Bag packing is also automated and packed bags move directly to freight cars and vans by conveyor.

Dayco Expands Divisions

► Dayco Corp., Dayton, Ohio, will expand production, shipping, and warehousing facilities at two divisions in Springfield, Mo., and Waynesville, N. C. The expansion program, costing over a million dollars, is expected to be completed this year. A 52,800 square foot addition to the Springday Co., the Dayco division in Springfield, will house enlarged laboratory and engineering facilities as well as increased V-belt manufacturing capacity. Completion is scheduled for the Fall. The expansion at the Dayco Southern division in Waynesville includes a 60,000 square foot warehouse, and 7,200 square feet of covered dock area. It will be used for foam latex, urethanes, V-belts and automotive hose. The building is designed so that it can be converted rapidly to a manufacturing facility.



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ASTM Committee D-24 Holds Annual Meeting

► Committee D-24 on Carbon Black of the American Society for Testing Materials and five of its subcommittees held its annual meeting on June 27, 1961, in Atlantic City, N. J., during the 64th Annual Meeting of ASTM. In its letter ballot of March, 1961, the committee approved the revised modulus limits for GPF black in D-1765-60T (Specifications for Carbon Blacks Used in Rubber Products), and the Proposed Tentative Method for Sampling Bulk Shipments of Carbon Black.

The Advisory Committee discussed the question of representation of D-24 with Committee D-11 on Rubber on the American Group for ISO/TC45. The committee recommended that Dr. Stiehler (National Bureau of Standards) request the subject of method of test and specifications of carbon black used in rubber products be placed on the agenda of the next ISO/TC45 meeting.

The reports of the subcommittees were read and approved. The following letter ballot will be sent jointly to D-24 and the appropriate subcommittees: Tentative Methods for Mass Strength of Pelleted Carbon Black (Subcommittee 1 on Physical Testing), and Revision of Tentative Specification D-1765-60T (Carbon Blacks Used in Rubber Products) to include proposed heating loss limits for carbon black (Subcommittee 7 on Specifications).

The vacancy on the Advisory Committee, as a result of the retirement of C. A. Carlton (J. M. Huber), will remain open until the next election of officers.

Committee D-24 proposed that its next meeting be held on February 5 and 6 in Dallas, Texas, during ASTM Committee Week.

Cary Chemicals Expands

► Cary Chemicals Inc., East Brunswick, N. J., is planning a $14 million investment in new production facilities, including construction of a new polymer plant designed to produce 150 million pounds per year of polyvinyl chloride. Location and design of the new facility are still under study. The $14 million investment is part of an over-all expansion program which, when completed by 1965, will increase Cary's polymerization capacity to 200 million pounds annually.

C. H. M. Baker

Named FBRAM President

► C. H. M. Baker, a director of the Firestone Tyre & Rubber Co., Ltd., England, took office as the 1961-1962 president of the Federation of British Rubber and Allied Manufactures on July 27 at the federation's Annual General Meeting. He succeeds H. G. W. Chichester-Miles (Empire Rubber Co.). The new FBRAM president, Mr. Baker, had been a vice-president of the federation since 1959, and one of the chief authors of its handbook on "Natural Rubber Grades and Contracts."

Vice-presidents of FBRAM for 1961-1962, who took office at the same time, are: D. E. Cameron, chairman and managing director of the B. B. Chemical Co., Ltd., and chairman of the Sealant Manufacturers' Conference of FBRAM; and D. D. Marshall, managing director of the Greengate & Irwell Rubber Co., Ltd., and chairman of the British Rubber and Plastics Belting Manufacturers' Association.

Mr. Chichester-Miles, in his review of two years as FBRAM president, called attention to the declining profit margins in many branches of British industry.

"Some people look upon profit making with aversion," he said, "but I suggest that, on reflection, such people would rather work for a concern making profits than for one making losses. I wish that the public at large could accept profit making as laudable, indeed as a duty. Without doubt our industries and our country will not continue to progress unless its efforts produce margins sufficient to ensure regular replacement and modernization of plant and equipment," Mr. Baker declared.

Foam Outlook Studied By Marketing Firm

► According to James M. Margolis, of the Chemical Marketing & Research Co., New York, N. Y., latex foam rubber is "taking a licking" from urethanes and vinyls. Mr. Margolis' remark was part of a press presentation in conjunction with two multiple sponsored surveys now in progress by his company. He explained that plastics foam demand for 1961 should amount to almost 200 million pounds. The demand was less than 20 million pounds in 1956. It appears to Mr. Margolis that in 1965, total plastics foam consumption, including both rigid and flexible, will amount to 750 million pounds. He pointed out that the significance of the 750 million figure is that forecasts for 1965 over the past several years now appear to be too conservative.

According to Mr. Margolis, rigid and flexible urethane foam combined sales may be revised to at least 500 million pounds a year by the end of 1965. He explained that by elimination, not by survey, this would leave up to 250 million pounds for polystyrene and vinyl foams, together with a few million pounds of cellular polyethylene, epoxy, and other foamed plastics, including phenolics, urea-formaldehyde, cellulosics, silicones, and furanes. He added that on the basis of 750 million pounds annually in 1965, foamed plastics materials can be valued at $1 billion for that year.

Firestone Names Three

► Firestone Tire & Rubber Co., Akron, Ohio, has announced three new appointments in its Tire Development Division. Melvin P. Hershey has been named manager of tire engineering, A. F. Weber has been appointed manager of highway truck tire engineering, and R. C. Shipman has been made manager of off-the-road tire engineering. Mr. Hershey, who joined Firestone's Aircraft Tire Engineering Division in 1941, has been manager of engineering for passenger, racing and airplane tires since 1958. Mr. Weber started with Firestone in 1943 and joined the Truck Tire Engineering Division in 1947. He was serving as manager of steel cord tire engineering at the time of his present appointment. Mr. Shipman, a former senior project engineer, has been with Firestone since 1947.

Paul J. Melore

In Columbian Carbon Post

► Paul J. Melore has been named technical product manager in the Sales Department of the Carbon Black and Pigment Division of the Columbian Carbon Co., New York, N. Y. He will be responsible for the sales development functions of Columbian's dispersion units located at Tacony, Philadelphia, Penna., and Deer Park, Texas. According to the company, Mr. Melore will concentrate his efforts on developing a market for new and improved dispersions of carbon black in all types of media. A graduate from Brooklyn College with a B.A. degree in chemistry, Mr. Melore was associated with the Hercules Powder Co. prior to joining the Research Department of Columbian Carbon in 1946.

Shell Appoints Yabroff

► Dr. D. L. Yabroff, formerly manager of research and development in the Industrial Chemicals Division of the Shell Chemical Co. in New York, has been named manager of chemical research and development at the research center of the Shell Development Co., Emeryville, Calif. In this capacity Dr. Yabroff will direct the long range research and development activities in the field of petrochemicals for Shell Chemical Co. A graduate of the University of Nebraska, Dr. Yabroff received his Ph.D. degree in chemistry from the University of California in 1931. He joined Shell Development in 1934 as a chemist in the Emeryville laboratories. He was appointed a department head in 1944 and an associate director of research in 1948. He directed Shell Development's Agricultural Research Division for three years before joining Shell Chemical in 1953.

Plans Building Exposition

► The Industrial Building Exposition & Congress, held for the first time in December, 1960, will be produced again in 1961 at the New York Coliseum, from September 25 through September 28. Arrangements for the exposition are being made by Clapp & Poliak, Inc., New York exposition management firm. Exhibits will occupy the two main floors of the Coliseum. The program of the congress which covered all major aspects of new construction and modernization will be repeated this year.

Exhibits and program topics will be aimed at three types of audiences: companies which have a continuing program of building new plants; companies which rarely erect new plants but have one planned or under consideration; and companies which have problems of modernization. Exhibits will cover eight major categories: structural materials and components; mechanical components and equipment; electrical components, materials and systems; heating and air handling; employee services; plant sites and services; financing; and auxiliary services.

New McCreary Tire

► McCreary Tire & Rubber Co., Indiana, Penna., has introduced the MC-70, a first-line, four-ply, nylon passenger tire featuring a three-rib tread design. The company states that the new MC-70 will not buckle under normal driving conditions, allowing even wear in the center and sides of the tire. The MC-70 has a low profile design that is wider than it is high, offering reduced flexing caused by road shocks and bumps, and decreasing chances of sidewall ruptures. Another feature of the tire is its use of 4100 sipes cut into a herring-bone pattern in the tread. This is said to improve traction and increase safety.

Offers Piccopale Resin

► A low-cost hydrocarbon resin emulsion, called Piccopale A-55, is being produced by the Pennsylvania Industrial Chemical Corp., Clairton, Penna. Developed for the vulcanized latex industry as a different type of reinforcing resin, it is said to be compatible with all types of latex. According to the company, use of Piccopale A-55 at a 20 per cent replacement level yields lower cost, higher tensile strength, improved modulus and elasticity, and increases tack in uncured films.

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Buys Koppers Stock

► Courtaulds, Ltd., the English textile fiber and chemical company, has acquired over 100,000 shares of common stock of the Koppers Co., Inc., Pittsburgh, Penna. The acquisition was made through its North American subsidiary, Courtaulds, North America, Inc., New York, N. Y. Two Courtaulds officials have been placed on the board of directors of the American company: J. Albert Woods, chairman of Courtaulds, North America, and Arthur W. Knight, director of Courtaulds, Ltd. A joint announcement has indicated that Courtaulds has no plans to acquire control of Koppers. Its holdings of over 100,000 shares are equal to between 4 and 5 per cent of the outstanding common stock of Koppers Co.

Appoints Dowdy Brothers

► Carbola Chemical Co., Inc., Natural Bridge, N. Y., has appointed Dowdy Brothers, Philadelphia, Penna., as distributors of Asbestol and Micro Velva extender pigments. Dowdy Brothers will supply manufacturers located in eastern Pennsylvania, New Jersey, from Trenton south, Delaware, and Maryland.

Glidden Names Two

► Glidden Co., Baltimore, Md., has named William J. Barnett sales manager for pigments for the Pigment and Color Department of its Chemicals Division, and John Owen Jones as product manager for colors. Mr. Barnett has been a Glidden sales executive for nearly 20 years and previously was sales manager of the division's southern district at Atlanta, Ga. His new headquarters will be at the firm's Adrian Joyce Works in Baltimore. Mr. Jones previously had been Glidden's district sales manager in Cleveland, Ohio. He will be located at the firm's St. Helena Works in Baltimore.

M-R Licenses Ameliorair

► Midland Ross Corp., Cleveland, Ohio, has concluded an agreement with Ameliorair, Societe Anonyme, Paris, France, granting Ameliorair the right to manufacture and sell a broad range of products of its J. O. Ross Engineering Division. The American firm will also acquire an interest in the French company, whose present major product lines include textile machinery, industrial ovens and air-conditioning equipment for industry.

Goodyear Processing Unit

► A $1.3 million stainless steel finishing line, with a capacity of 16,000 long tons per year, has been opened by the Goodyear Tire & Rubber Co. at its Houston, Texas, synthetic rubber processing unit. The Houston plant has a total annual capacity of 245,000 long tons, and produces 13 different synthetic rubbers made from styrene and butadiene. Included in the expanded facilities are blending tanks that hold thousands of gallons, mixing vats with gigantic egg-beater type devices to agitate the rubber, sifter screens for straining, vibrating metal spiral conveyors, and a 150-foot long, single pass, gas-fired oven for drying the rubber. The company states that the completely stainless steel finishing line will enable the plant to add initially at least four new products, including electrical grade rubber, and other low-water absorption rubbers. Use of stainless steel on interior as well as exterior surfaces of all equipment is designed to cut contamination and assure production of higher quality specialty rubber. Instead of the conventional single washing operation of commercial production synthetic units, rubber processed through the new finishing line will be subjected to a double washing cycle to remove impurities. In drying the rubber, only filtered air from an indirect heat source will be used.

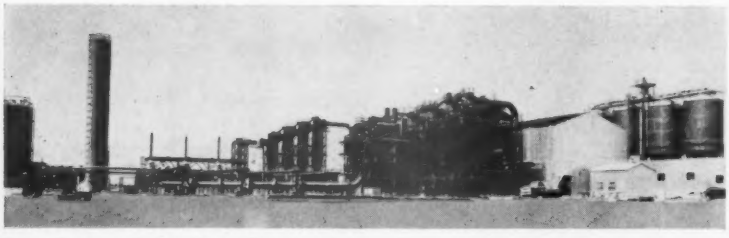
Buys Interchemical Unit

► Chemsol, Inc., Elizabeth, N. J., has purchased a large industrial plant, consisting of brick buildings occupying 90,000 square feet, from the Interchemical Corp., Newark, N. J. The plant, covering almost a complete square block, formerly housed the Coated Fabrics Division of Interchemical, which is consolidating this operation into its Toledo, Ohio, facility. Chemsol will use the plant for expanded operations of its Plastic Division, which covers the compounding of plastic resins and rubber products. George Terpak Jr., vice-president of Chemsol, is in charge of the division.

Cary to Build PVC Unit

► Cary Chemicals, Inc., East Brunswick, N. J., will build a plant west of Burlington, N. J., which will turn out 100,000,000 pounds of polyvinyl chloride a year. The company states that it will receive most of its raw materials via tanker from the Tenneco Chemical Co., Houston, Texas.

Witco-Continental Opens Pacific Unit



Over-all view of the Witco-Continental 50 million pound per year capacity carbon black plant at Bakersfield, Calif.

► The new $4 million carbon black plant and laboratories of the Witco Chemical Co. and the Continental Carbon Co. went on stream on August 9 at Bakersfield, Calif. Said to be the first of its kind on the West Coast, the new facility has an annual capacity of 50 million pounds of oil furnace black in HAF, ISAF, FEF, and GPF grades. According to the companies, an estimated 95 per cent of the total output will go to the West Coast rubber industry, now the second largest rubber manufacturing center in the U. S.

The Bakersfield facilities include a modern laboratory fully equipped for rubber compounding and testing. In addition, a staff of traveling technical representatives is available. Specifically designed features of the plant include a highly instrumented, automated system of controls for the precise regulation of temperatures, feed stock flow rates, and other operational conditions of significance to uniformity of product quality; and exclusive patented packaging equipment, company officials point out.

Rubber Section Meets At Safety Congress

► The Rubber Section of the National Safety Council will meet on October 16 and 17, 1961, at the Conrad Hilton Hotel in Chicago, Ill., during the 1961 National Safety Congress and Exposition. F. W. Sands (U. S. Rubber) will serve as general chairman. The two-day program includes an election of 1961-1962 officers, the reading of four papers, and a luncheon. Jim Low, staff speaker for the National Association of Manufacturers, will be the luncheon speaker, and his subject will be "Production and Accident Prevention Are Parallel and Paramount." W. M. Graff (U. S. Rubber) will be the toastmaster.

Papers to be presented on October 16 are: "Control of Health Hazards" by I. Matelsky (General Electric), and "Off-the-Job Safety at World Bestos" by J. R. Speers (World Bestos Division of Firestone).

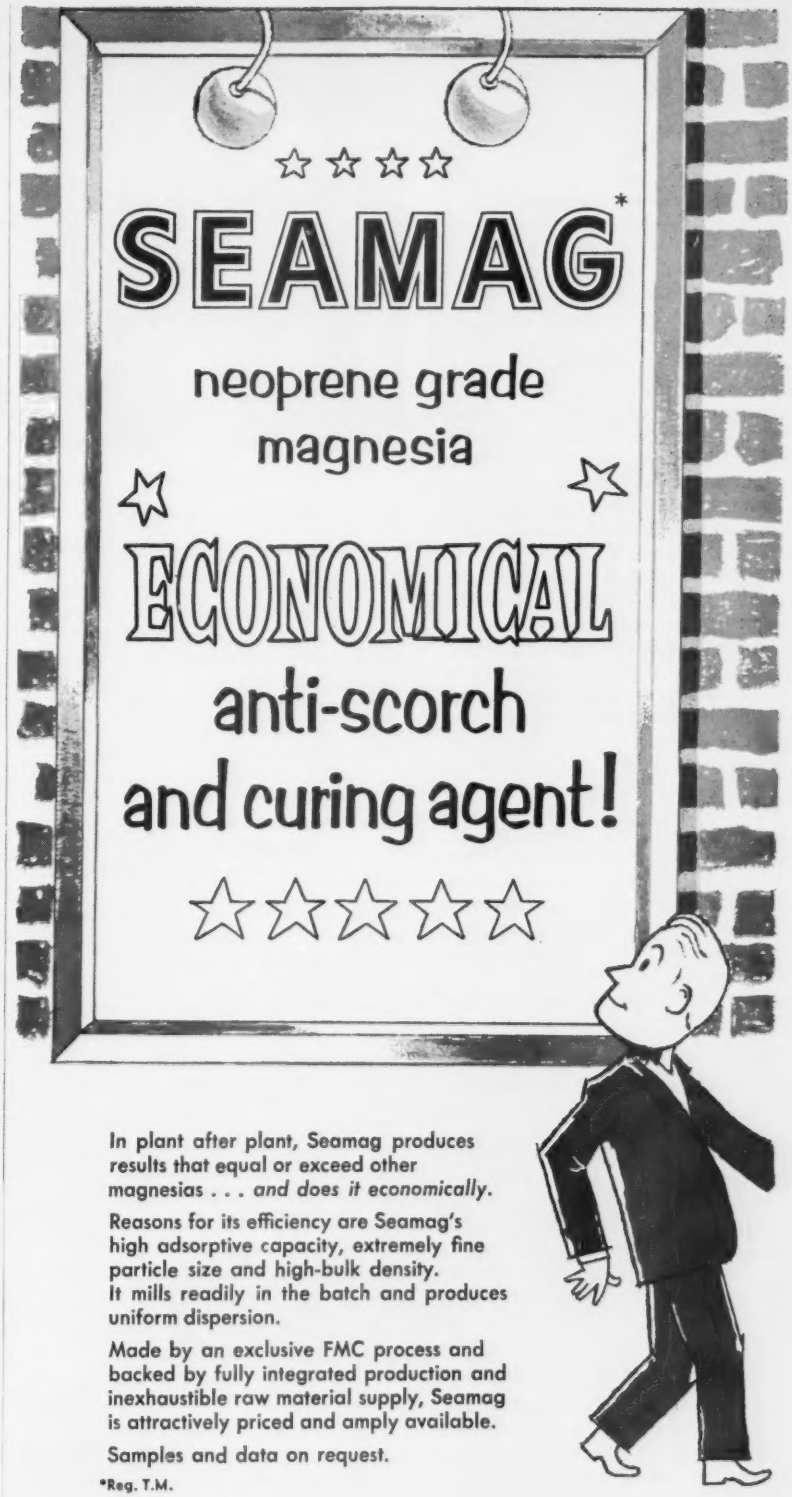
Ray Hart (Dayco) will preside at the October 17 session, and the papers to be given are: "An Exercise in Accident Investigation" by L. W. Boulton (Polymer Corp., Sarnia), and "The Industrial Nurse's Role in the Safety Program" by Miss Regina Knapp, R.N. (General Tire).

Montecatini Invests Here

► The Montecatini Co., Milan, Italy, has further expanded its interests in the United States with the purchase of 200,000 shares of stock of the Minerals & Chemicals Philipp Corp., Menlo Park, N. J. The shares, equal to about 4 per cent of the company's outstanding common stock, were bought privately from three officers of Minerals & Chemicals Philipp. The market value of the shares amounted to $5,700,000. Minerals & Chemicals Philipp also revealed that Piero Giustiniani, managing director of Montecatini, has been elected a director of the American firm.

Lewis Welding Plans Unit

► Lewis Welding & Engineering Corp., Cleveland, Ohio, will consolidate operations of its two divisions at a $1 million plant to be built in Solon, Ohio. The company revealed that growth of the company's design and engineering work and development of a number of special proprietary products led to the consolidation.



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Cabot Names Four

► Cabot Corp., Boston, Mass., has announced four new appointments to its technical staff. Peter A. Rubel has joined the organic and polymer research section of the New Products Research Department as a chemist. Wendell Potter has become a member of the market development of new products section of the Development Department. Porter F. Gridley has been appointed to the carbon black applications research section of the Carbon Black Research Department as a chemical engineer. Reginald Yeung has joined the applied research section of the New Products Research Department as a chemical engineer.

Mr. Rubel received his B.A. degree in biochemical science from Harvard College in 1953. He was engaged in chemical research with Dewey & Almy Chemical Co. before joining Cabot. Mr. Potter graduated from the University of Massachusetts with a B.S. degree in chemistry in 1938. Before joining Cabot, he was associated with Boston Woven Hose and Rubber Co. as a manager in the Sales Department. Mr. Gridley, a 1959 graduate of the University of Pennsylvania with a degree in chemical engineering, was previously associated with the Boro Marine Construction Co. Mr. Yeung received his B.S. degree from the University College of West Indies, Jamaica in 1954, his M.S. from the Massachusetts Institute of Technology in 1959, and his doctorate in 1961.

A-H Consolidating Plants

► Acme - Hamilton Manufacturing Corp., Trenton, N. J., has announced plans to consolidate its two separate plants in Trenton into one 400,000 square foot unit now under construction. The company reports that when completed, some time in December of this year, the highly automated plant should eventually reduce production costs by $1,500,000 annually.

Builds New Warehouse

► General Tire & Rubber Co., Akron, Ohio, will build a 75,000-square-foot warehouse and tire recapping plant on a 7½ acre tract in Brook Hollow Industrial District, Dallas, Texas. Tires recapped here will be the giant type used on heavy-duty off-the-road dirt-moving machinery and similar equipment, as well as all regular truck and passenger tires.

Joseph Breckley

Announces Retirement

► Joseph Breckley, assistant manager of the technical service laboratories of the Titanium Pigment Corp., New York, N. Y. has announced his retirement. Mr. Breckley had been associated with Titanium Pigment for the past 26 years. Born at Ocean City, N. J., August 19, 1896, Mr. Breckley received a B.S. degree in chemistry from Rutgers University in 1919. The same year, he joined the B. F. Goodrich Co. as a chemist and compounder. Subsequently, he became chief chemist and production manager of the Lambertville Rubber Co., and technical superintendent of the Seamless Rubber Co. From 1924 to 1935, Mr. Breckley was employed by the Dovan Chemical Corp., where he served as sales manager and secretary. He joined Titanium Pigments in 1935 and pioneered the use of titanium pigments in the rubber and plastics industries. Mr. Breckley is a member of the American Chemical Society and its Division of Rubber Chemistry of which he was a director. He was also a member of the American Society for Testing Materials and had served as chairman of the New York Rubber Group.

Pangborn Adds to Line

► Pangborn Corp., Hagerstown, Md., has created a new department which will manufacture and market special rubber and plastics finishing machines and equipment. William A. McCormick, Jr., formerly branch sales manager for the Industrial Division of the American-Standard Corp., has joined the firm as manager of the new department.

BDSA Appoints Douce

► William C. Douce, assistant manager of the Rubber Chemicals Sales Division of the Phillips Chemical Co., Bartlesville, Okla., has been named assistant director for Mobilization Planning, Chemical and Rubber Division, Business and Defense Services Administration, U. S. Department of Commerce, Washington, D. C. The appointment was made under an arrangement whereby industry makes the services of key officials available for temporary duty—usually six months — without compensation from the Government. Mr. Douce joined Phillips in 1942 following graduation from the University of Kansas with a B.A. degree in chemical engineering. He was appointed assistant manager of the Rubber Chemicals Sales Division in 1959. His present assignment with the BDSA also qualifies him for membership in the National Defense Executive Reserve, which would staff the operation of a production agency in the event of a national emergency.

Birdsboro Forms Division

► Birdsboro Corp., Birdsboro, Penna. has formed a Chemical Machinery Division which will manufacture a broad range of chemical process equipment and special purpose machinery for the rubber, plastics, chemical, paint, rayon, and other industries. Products of the new division will be manufactured at the company's Reading, Penna., plant. Henry W. North, president of the H. W. North Co., Erie, Penna., has been appointed manager of the division which, under an exclusive licensing agreement, will now make the complete line of North-Erie products previously produced and sold by the North organization.

Traflet Appointed

► Robert F. Traflet has been named product manager of A-C polyethylene for the Plastics Division of the Allied Chemical Corp., New York, N. Y. Mr. Traflet graduated from the Villanova University School of Chemical Engineering in 1954. Since joining Allied Chemical in 1958, he has served as a salesman in the New York-New Jersey area for the Semet-Solvay Petro Chemical Division, and as assistant to the product manager of thermosetting resins.

Kaiser Installs Vulcanizer

► Kaiser Aluminum & Chemical Corp. has installed new equipment in its Bristol, R. I. plant for insulating copper and aluminum electrical conductors. Known as a vertical continuous vulcanizer, the equipment is housed in a 126-foot aluminum-clad tower and, according to Kaiser Aluminum, represents the tallest and largest vertical "CV" machine in existence. Natural and synthetic rubber insulating materials are extruded around a preheated conductor at the top of the tower and cured in a steam vulcanizing tube extending downward. The cable continues down vertically through a water cooling tube, turns on a capstan, and is cooled further in a horizontal water tube before being hauled onto a take-up reel at ground level. The equipment enables Kaiser Aluminum to insulate larger cables with superior control over surface characteristics, density, centering and roundness, and to handle conductor lengths up to 3,000 feet. The company will use the facility for insulating and curing portable cables, building wire and power cables rated from 600 to 15,000 volts. Insulations for cables rated up to 35,000 volts can be produced should the need arise.

Goodrich Names Chemists

► Marvin H. Lehr and Charles E. Ziegler have been named senior research chemists at the B. F. Goodrich Research Center, Brecksville, Ohio. Mr. Lehr received his B.A. degree in 1954 from Reed College and his M.A. in chemistry from Yale University. He joined Goodrich as a research chemist in 1959, the same year he received his Ph.D. degree in chemistry from Yale. Mr. Ziegler received his M.A. and Ph.D. degrees in chemistry from the Swiss Federal Institute of Technology, Zurich, Switzerland. He has been a research chemist at Goodrich since 1959.

Joins Ozone Research

► Dr. B.I.C.F. van Pul, formerly with the Institute of Rubber Research, TNO Delft, Netherlands, has joined the staff of the Ozone Research & Equipment Corp., Phoenix, Ariz., as vice-president of research. Dr. van Pul received his B.S. degree in chemistry in 1948, his M.S. degree in chemistry in 1951, and his Ph.D. degree in technological science in 1956. Dr. van Pul's principal area of investigation for the past eight years has been the ozone resistance of rubber, and he is the inventor of the European ozone test chamber that bears his name.

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An aerial view of the principal construction now completed at the new Research Center of the Koppers Co. in Somervell Park, Monroeville, Penna. Koppers operates eight other research and development facilities of varying sizes where product and process control, application research, and pilot plant operations are the principal activities.

Koppers Opens New Research Center

► Koppers Co., Pittsburgh, Penna., dedicated its new $8½ million Research Center at Somervell Park, Monroeville, Penna., on August 28. Said to be one of the most advanced facilities of its kind in the country, the new center will be the headquarters of Koppers' Research Department. Designed to handle the research needs of the firm for the next 40 years, the center will eventually house over 1,500 scientists, about four times its initial population. Only about one-third of the buildings planned for the 176-acre site have been completed. No firm schedule for construction of the remaining buildings has yet been set. This emphasis on planned expansion reflects the reason the new center was built: Koppers had outgrown its research facilities at Verona, Penna.

One of the many divisions of Koppers using the new facilities will be the Resins and Adhesives Group of the Chemicals and Dyestuffs Research Section. Koppers position as the leading American producer of resorcinol has led to a number of significant developments by this group. One of these was the introduction of resorcinol - formaldehyde resins and adhesives called Penacolites.

At present, the principal use of these resins is in formulating room temperature or fast-curing adhesives for laminating timber beams or bonding tire cords. In timber lamination, these adhesives form a bond at 70° F. and provide a completely waterproof juncture. The group has recently developed a new adhesive particularly suited for bonding Douglas fir in the 40° to 60° F. range.

Resorcinol - formaldehyde resins mixed with rubber latices are now widely used to bond rayon and nylon tire cord to both natural and synthetic rubber tire carcasses. In this area, the Resins and Adhesives Group has recently developed an adhesive that is said to be superior in bonding rayon cord to butyl rubber. In addition, the group is developing butadiene - dipoxide resins as well as other types of epoxy resins.

The new center presently consists of a five-story administration building, three 3-story interconnecting laboratory wings, and several outlying auxiliary buildings. A feature of the center which contributes to its easy expansibility are the glass enclosed stairways at the end of each wing which can easily be removed when additions are called for, and reaffixed to the end of the new wing. Another advanced feature is its interior design. Laboratory wings, interconnected with each other and with the administration building, have offices on one side, laboratories on the other. This design gives an efficiency which reserves research space for research and office space for office work.

At the dedication ceremony, Mrs. Brehan Somervell, widow of the late Commanding General of the Army Service Forces, unveiled a bust of her husband who was chairman of the board and president of Koppers until his death in 1955.

Naugatuck Names Allard

► Claude H. Allard, formerly superintendent of chemical production at the main plant of the Naugatuck Chemical Division of U. S. Rubber Co., Naugatuck, Conn., has been appointed director of marketing for the division. In his new post, Mr. Allard will supervise all marketing operations for the division's complete line of products. A graduate of Lowell Technological Institute with a B.S. degree in chemistry, Mr. Allard joined Naugatuck as a research chemist in 1947, shortly after obtaining his degree. Two years later he was assigned to the division's sales staff. In 1955, when the division organized its sales staff along district lines, he was appointed Gastonia district sales manager. In this post, he also managed the operation of the division's latex compounding plant in Gastonia. He returned to the main plant in 1958 to become general superintendent of the synthetic rubber plant, and in 1960 he became superintendent of all chemical production at the Naugatuck plant.

O'Sullivan-Gebhardt Pact

► O'Sullivan Rubber Corp., Winchester, Va., and the A. L. Gebhardt Co., Milwaukee, Wisc., have agreed to an association under which A. L. Gebhardt will serve O'Sullivan in the sales and technical servicing fields in Wisconsin, Minnesota, Illinois, Michigan, Iowa and Nebraska. Charles A. McKenney, Jr., vice-president and general manager of O'Sullivan's Rubber Division, and Arthur A. Gebhardt, Jr., vice-president of A. L. Gebhardt, will administer operations of the new marketing arrangement for their respective companies.

Offers Stick-Not No. 762

► Stick-Not No. 762, a release paper suitable for use as a carrier for calendered rubber, is available from Crocker, Burbank Papers Inc., Fitchburg, Mass. The uniformly coated surface of the paper is said to impart a higher finish to the rubber and to provide excellent release from rubber products. Highly heat resistant, Stick-Not can be put through the heat curing ovens at temperatures up to 450° F. without effect. In addition, the company states, the paper is strong and tear resistant and can be easily die-cut and printed on the untreated side.

H. M. Sprock, Jr.

Selling Goodrich Hycar

► B. F. Goodrich Chemical Co., Cleveland, Ohio, has appointed Howard M. Sprock, Jr., as sales representative for Hycar special purpose rubber. In his new post, Mr. Sprock will be responsible for Hycar latex and dry rubber sales in southern Virginia and most of North Carolina. He has been active in this area for the past year promoting the sale of Goodrich Chemical products for the textile industry. He is a 1956 graduate of North Carolina State College with a B.S. degree in textiles. Prior to joining Goodrich Chemical in 1959, Mr. Sprock was associated with the Geigy Chemical Co.

Improves Rayon Cord

► American Viscose Corp., New York, N. Y., is producing a new Tyrex rayon tire yarn said to be 15 per cent stronger than current yarns. The new yarn has a tensile strength of over 40 pounds in a standard 1650 two-ply cord and, according to the manufacturer, is particularly suited for use in two-ply tire construction. The Tyrex yarn reportedly retains all the advantages of current Tyrex rayon cord. It will be available in all deniers for use in passenger and heavy-duty tires.

Wire Symposium Planned

► The Tenth Annual Wire and Cable Symposium, sponsored jointly by the U. S. Army Signal Research and Development Laboratory and by the wire and cable industry, will be held at the Berkeley-Carteret Hotel, Asbury Park, N. J., on November 29 and 30, and December 1, 1961. Some 25 papers will be presented which will point out progress in various phases of the field of communication wires and cables.

Chardon Names Oplinger

► Howard L. Oplinger has been named general manager of the Chardon Rubber Co., Chardon, Ohio. He succeeds Claude L. Shreiner, former president and general manager, who has retired after 38 years in the rubber industry and 32 years at Chardon. The company has also announced the appointment of Bruce A. Paepke as manufacturing manager.

Mr. Oplinger joined Chardon Rubber in 1936, after having served with the Firestone Tire and Rubber Co. He has occupied several positions at Chardon, including that of chemist, chief chemist, plant manager, and vice-president for manufacturing. He has also served on various technical and policy committees of the Rubber Manufacturers Association. Mr. Paepke came to the Chardon organization in 1955 from the West Coast Division of the parent Ball Brothers Co., where he had served as controller. He had been serving as controller of Chardon Rubber prior to his present appointment.

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Robert H. Walsh

Named by DuPont

► Robert H. Walsh has been appointed assistant manager of market development for the Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Mr. Walsh recently returned from two years in Europe where he served as elastomers sales manager for DuPont Co. (United Kingdom) Ltd., London, and assistant marketing manager for elastomers for DuPont de Nemours International S.A., Geneva, Switzerland. Mr. Walsh joined DuPont in 1942 as a chemist at the rubber laboratory, and was named senior research chemist in 1951. He was appointed head of the Neoprene Latex Division in 1952, and in 1953 was assigned to head a group on the development of new products. For two years prior to his European assignment, he was assistant director of the company's sales service laboratory for elastomers, where he was responsible for new product development and technical sales service.

Thiokol Buys Hi-Polymer

► Thiokol Chemical Corp., Trenton, N. J., has purchased the Hi-Polymer Corp., Hudson, Mass., producers of acrylic elastomers. The Chemical Operations Division of Thiokol is producing the acrylic base elastomers in its Trenton facilities and marketing them under the trademark of Thiacril acrylic rubbers. According to Thiokol, Thiacril acrylic rubber 36 will be produced initially. This material is said to offer properties of resistance to high heat and oils, including oils of the sulfur bearing type. Application areas include use as oil resistant seals, O-rings, and gaskets.

Mobay Relocating Center

► Mobay Chemical Co., Pittsburgh, Penna., has announced plans to relocate its research headquarters and customer service facilities from New Martinsville, West Va. to suburban Pittsburgh, where it is building a new 50,000 square foot research center. Scheduled for completion in the Fall of 1962, the complex of new buildings will extend from Mobay's present headquarters office on the Penn Lincoln Parkway West, midway between the Greater Pittsburgh Airport and the Golden Triangle. Inter-connecting units will house general research facilities, customer service laboratories, administrative offices, and a technical library. A main portion of the new center will be devoted to a demonstration laboratory equipped with commercial-scale production machinery of the kind used by industry in processing urethane chemicals and polycarbonate resins into end-use consumer products. According to Mobay, research groups allied with plant and process engineering will remain at its present facility in New Martinsville.

United Carbon Laboratory

► A new $2,000,000 research center will be constructed on a 32-acre site outside of Houston, Texas, by the United Carbon Co. The centralized facilities are being erected, the company states, to enable the firm to coordinate its research and development work in the carbon black, synthetic rubber, polymer, and petrochemical fields. The initial three-building unit will include a one-story laboratory with adjacent facilities for small-scale development work, and a central quality control laboratory. Completion of the research center is scheduled for Spring, 1962.

Markets Truflex 300

► Thompson Chemical Co., Pawtucket, R. I., has introduced a primary plasticizer designed to meet the rigid service requirements of high temperature wire insulation. Designated Truflex 300, the plasticizer is said to offer particularly low volatility for a primary, excellent retention of physical properties after prolonged heat aging, resistance to moisture, and outstanding electrical properties.

Fred C. Ubinger

Joins Neville Chemical

► Fred C. Ubinger has joined the Technical Division of the Neville Chemical Co., Pittsburgh, Penna., where he will be engaged in coatings development and technical service work in the Product Development Department. Mr. Ubinger received his B.S. degree in chemistry from Duquesne University in 1953. He has served as a paint chemist for Thompson & Co., and since 1955 has been associated with the Micarta Division of Westinghouse Electric Corp. as a coatings development chemist. He is a member of the American Chemical Society, as well as of the ACS Division of Organic Coatings and Plastics Chemistry.

Mueller Completes Study

► Dr. Hans J. Mueller, consulting chemist and engineer, Chicago, Ill., has returned to the United States from Munich, Germany, where he had been working on a study of the Redox System with Prof. Patat, an authority on polymerization reactions. Results of his study on "Redox System $S_2O_8'' + 2S_2O_3'' = 2SO_4 + S_4O_6''$ as an Initiator for Polymerization Reactions" appeared in the German publication *Die Makromolekulare Chemie*, September 2, 1960. Dr. Mueller had been a professor of chemistry at the University of Illinois prior to taking his sabbatical year to study in Munich.

► A survey of 14 leading tire firms, entitled "A Study of the Corporate Personality: An Appraisal of Leading Tire Manufacturers by Business Executives," can be obtained from H. C. Sturm, Director of Advertising, *Nation's Business*, 711 Third Ave., New York 17, N. Y.

R. D. Johnson

Appointed Representative

► B. F. Goodrich Chemical Co., Cleveland, Ohio, has named Robert D. Johnson sales representative for Hycar special purpose rubber. He will be located in Minneapolis and will service Minnesota, Iowa, and northern Wisconsin. Mr. Johnson was associated with E. I. du Pont de Nemours & Co., Inc. for ten years before joining Goodrich Chemical in 1951. After several years of product development work at Goodrich Chemical's Avon Lake, Ohio Development Center he was assigned to Darvan fiber sales development in Cleveland. In 1959 Mr. Johnson returned to Avon Lake to work on Hycar product applications at the Development Center's product applications laboratory. He was assigned to the Hycar sales office in Cleveland earlier this year.

Introduces Recco 159

► Recco 159, a resinous plasticizer and tackifier for acrylonitrile type rubbers, vinyl chloride polymers and copolymers, is now available from R. E. Carroll, Inc., Trenton, N. J. The plasticizer is a mixture of resinous and nonvolatile aromatic esters, with all light and fugitive materials removed. Outstanding characteristics are said to be its complete insolubility in, and resistance to, aliphatic hydrocarbons and water. In addition, Carroll states, its excellent compatibility with nitrile rubber and the various vinyl chloride polymers and copolymers will improve quality, tack, bonding and plasticizing. Its high grease and oil resistance qualities are recommended for gasoline and solvent resistant hose, gaskets, belting and various mechanical goods. Recco 159 is not recommended for use in natural rubber and SBR, as it appears to be incompatible.

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MCP Holds Sales Meeting

► Sales representatives and distributors for the Minerals & Chemicals Philipp Corp., attending a four-day sales training meeting held recently at Menlo Park, N. J., learned that the rubber industry is second only to the paper industry in the use of filler clays in its formulations. Speaking at MCP's 6th Annual Technical Sales Conference, J. Bennett, of the Goodyear Tire & Rubber Co., described the chemistry of rubber, how it is made, and the part clay has in its compounding. The discussion was held in connection with MCP's distributor training program, which this year emphasized the close tie that exists between the firm's Sales and Research Departments.

In his talk, Mr. Bennett explained that to people in the rubber industry, clay is either hard or soft, since these properties impart certain desirable characteristics to the rubber. He pointed out that other factors are also considered, such as geographical source, the methods of production, specific gravity, and moisture content of the clay. Mr. Bennett also described the effect clay has on a rubber compound, using Goodyear's Plioflex rubber compounds and their commercial applications as an example.

To Produce Two-Ply Tires

► Firestone Tire & Rubber Co., Akron, Ohio, will produce two-ply tires for next year's models of several standard sizes of automobiles, in addition to its original equipment two-ply tires for compact models and tires for small, lightweight European cars. The two-ply tires for American cars will have four-ply ratings in all sizes manufactured, and will carry the same road hazard guarantees as their four-ply counterparts. The company has introduced several innovations in the construction of the two-ply tire, including a new method of locking the beads into the tire, a layer of red rubber between the tread and cord body to warn motorists when treads are worn, nylon reinforcement, a new curing process, stronger body cord and a new tread rubber.

► Vulcanized Rubber & Plastics Co. has moved its executive and sales offices from New York City to the firm's plant at Morrisville, Penna.

R. H. Roberts, Jr.

Named by Huber

► Richard H. Roberts, Jr. has been named manager of the J. M. Huber Corp. laboratory in Borger, Texas. The recently enlarged laboratory is engaged in research and technical service for Huber's carbon black, kaolin clay, and chemical products. Mr. Roberts is a graduate of East Texas State College with a B.S. degree in chemistry, and has done graduate work at the University of Texas and the University of Colorado, the latter in management. Before joining Huber, Mr. Roberts was associated with the Dow Chemical Co.

DuPont Forms French Firm

► A new French chemical company has been formed by E. I. du Pont de Nemours & Co., Wilmington, Del., and Etablissements Kuhlmann, Paris, France, to manufacture and market isocyanates. DuPont and Etablissements Kuhlmann will each own 50 per cent of the stock of the new company, to be called Dekachimie, and capitalization will amount to about $6 million. Dekachimie will build a plant near Lille at Etablissements Kuhlmann's existing La Madeleine facility. Construction is expected to begin early in 1962, with completion scheduled during 1963.

In addition to the plant site for the new venture, Etablissements Kuhlmann will provide raw materials, service facilities, engineering and construction forces, and employees to operate the plant. DuPont will provide product technology and engineering consulting services. Both companies will provide capital.

New Goodyear Tires

► A new pneumatic industrial tire and a wider-tread automobile tire with a stronger nylon cord body have been introduced by the Goodyear Tire & Rubber Co., Akron, Ohio. The company states that the tread of the Cross Rib Industrial Tire is up to 60 per cent thicker than those of ordinary industrial pneumatics and is ideally fitted for mine service and on fork-lifts used in warehouses, lumber yards, steel mills and other factories. Heavy zig-zag lugs leading in from each shoulder provide sure traction and braking ability. A special compound of tough rubber to fight gouging and abrasion plus a tough body of tempered cord are said to provide outstanding strength for the industrial tire.

The new Nylon All-Weather auto tire is said to deliver six per cent more wear than previous low-cost auto tires. Bruise resistance and high speed durability also are improved by a tire body that is ten per cent stronger than that of its predecessor, Goodyear states. The tire tread design is composed of seven zig-zag ribs, with knife-edge blading for added traction.

Amsco Names Four

► American Mineral Spirits Co., Chicago, Ill., has announced four appointments to its sales staff. J. T. Hosse will represent Amsco in Nashville, Tenn., Morris Clyde will represent the firm in Louisiana and southern Mississippi, Hoyd K. Wooten will handle Amsco's line throughout Alabama and the adjoining portion of Florida, and Nicholas J. Maselli will represent Amsco in metropolitan Providence, R. I. Mr. Hosse is a graduate of David Lipscomb College in Nashville. He was previously connected with the educational systems of Florida and Nashville. Mr. Clyde, a graduate of Marquette University, was formerly a laboratory equipment specialist. Mr. Wooten graduated from Louisiana Polytechnic Institute. He joins the company after representing Visco Products Co. and Wayne Pump. Mr. Maselli, a graduate of Bryant College, was previously representative for the John Hancock Insurance Co.

► The Silicone Products Department of the General Electric Co. has moved its Detroit, Mich., sales office to 21590 Greenfield Road, Oak Park, Mich.

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Names in the News

Peter J. Marcello, vice-president in charge of operations of Acme-Hamilton Manufacturing Corp., New York, N. Y., has been elected a director of the firm, and **Edward V. Ecklund** has been elected treasurer.

W. B. Moen, formerly assistant manager of the Cryogenic Engineering Department of Air Reduction Sales Co., Plainfield, N. J., has been promoted to manager of the department.

Paul Nearhood, formerly with the B. F. Goodrich Industrial Products Co., has been named vice-president of sales for the Hercules Equipment & Rubber Co., San Francisco, Calif. **George Burch,** previously comptroller for Hercules, has been named treasurer.

Thomas B. Howley, formerly a product manager at Lever Brothers, has been named manager of the Stearates Industry Division for the Nuodex Products Division of Heyden Newport Chemical Corp., New York, N. Y.

J. Carson Dowell, formerly assistant to the president, has been appointed vice-president of the Kelly-Springfield Tire Co., Cumberland, Md.

F. S. Wittenauer, formerly chief account of the Lee Rubber & Tire Corp., Youngstown, Ohio, has been promoted to the position of assistant general sales manager of the company's Republic Rubber Division.

John W. Brownley, previously vice-president of manufacturing for Industrial Rayon Corp., has been named vice-president of marketing, succeeding **George L. Rounds,** who has retired after 38 years of service.

Edwin H. Sonnecken, formerly associated with the Market Planning Corp., has joined the executive staff of the Goodyear Tire & Rubber Co., Akron, Ohio, as marketing specialist.

W. E. Boruff has been named manager of new product applications of the Chemical Division of General Tire & Rubber Co., Akron, Ohio.

S. L. Scordelis, formerly engineer at the Emeryville, Calif., research center of the Shell Development Co., has been appointed manager of services at the Plastics Technical Center of the company's new Woodbury, N. J., plant.

Hugh G. Johnson, director of the Johnson Rubber Co., Middlefield, Ohio, has retired from the post he has held for the past 63 years.

W. Kenneth Hill has been assigned as a technical sales representative in the New England sales region of the Union Carbide Plastics Co., New York, N. Y.

Andrew J. McNeill, acting division purchasing agent for Naugatuck Chemical, Naugatuck, Conn., has been appointed divisional purchasing agent.

Harold F. Nunn, formerly vice-president, general manager, and a director of the H. K. Porter Co., Ltd., has been elected a vice-president of the Eagle-Picher Co., Cincinnati, Ohio.

Clifford H. Shumaker, chairman of the Department of Industrial Engineering of Southern Methodist University, Dallas, Texas, has been named president of the American Society of Mechanical Engineers.

Joachim H. Becker, formerly associated with DuPont, has joined the Chemicals Division of J. M. Huber Corp., at Havre de Grace, Md., in the newly-created post of engineering development manager.

Donald E. Schick, formerly assistant manager of the Central Division of the Enjay Chemical Co., New York, N. Y., has been named marketing coordinator for the Paramins Division, replacing **Gordon C. Seeler,** who has been named head of the additives section at the Enjay Laboratories, Linden, N. J.

Andrew J. McNeill, acting divisional purchasing agent for Naugatuck Chemical, Naugatuck, Conn., has been appointed divisional purchasing agent.

Richard F. Finn, formerly in the technical sales service unit of Esso Research & Engineering Co., has become section head of the butyl non-transport section of Enjay Laboratories, Linden, N. J.

Paul E. Jacobs, manager of personnel at the General Tire & Rubber Co., Akron, Ohio, has been elected president of the International Institute in Akron, succeeding **Arthur Williams** of the B. F. Goodrich Co.

Gerald W. Blakeley, Jr., president of Cabot, Cabot & Forbes Co., has been elected to the board of directors of the Pennsalt Chemicals Corp., Philadelphia, Penna. He replaces **Leonard T. Beale,** who has retired as a director after 38 years with the company.

Norman P. Ottley, previously associated with American Cyanamid Co., has been appointed as general purchasing agent for raw materials and fuels for all divisions of the Witco Chemical Co., Inc., New York, N. Y.

Dr. Robert B. Blodgett has been named director of research at the Okonite Co., Passaic, N. J.

W. E. Boruff has been named manager of new products applications for the Chemical Division of General Tire & Rubber Co., Akron, Ohio.

William C. Buffing, Jr., treasurer of the National Starch & Chemical Corp., New York, N. Y., has been elected vice-president of the company.

Dr. William R. Johnson, Jr. has been appointed to the Polymer Research Department of the W. R. Grace & Co. research center, Clarksville, Md.

John J. Speed, formerly personnel relations manager at the Rensselaer, New York, plant of the General Aniline & Film Corp., has been named to the newly-created post of manager of special projects in the chemical group, in New York City.

Allen C. Bluestein, formerly head development chemist, rubber and plastics research, Anaconda Wire & Cable Co., Marion, Indiana, is now associated with the Aerovox Corp., New Bedford, Mass., as technical director in charge of research and development.

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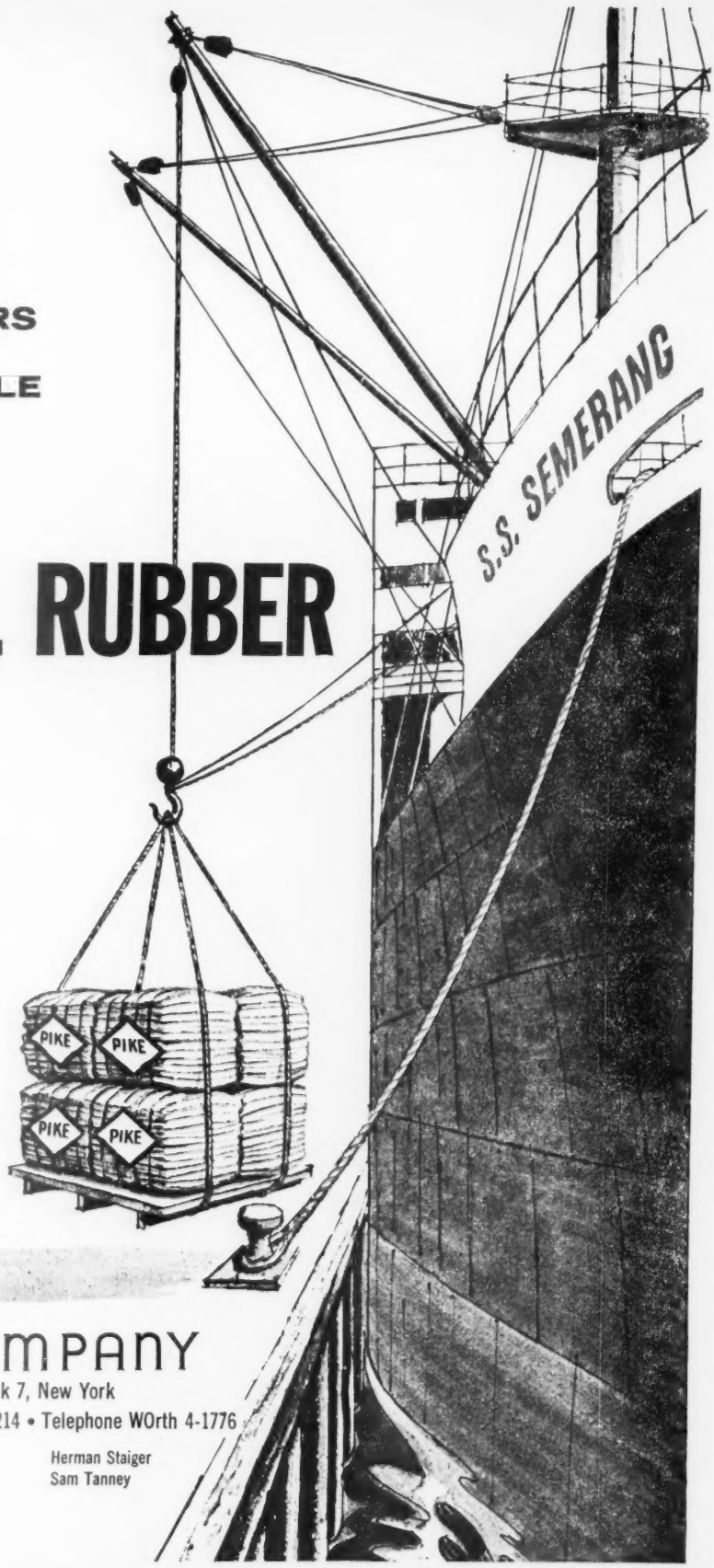

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ANALYSIS OF RUBBER

by W. C. Wake $8.00

The first modern work devoted solely to this important subject to be published in English. In addition to an analysis of natural and synthetic rubbers, the author deals with polyethylene, polyvinyl chloride, polyvinyl alcohol and the polyurethanes. The identification of compounding ingredients used in these polymers is discussed. This work will unquestionably become a standard and is a "must" for all those concerned with the analysis of rubber and rubberlike polymers.

ENGINEERING DESIGN WITH RUBBER

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Among the most important works of its kind, this book covers (among others) the following subjects: The Rubberlike State, Dynamic and Related Time-Dependent Properties of Rubber, Dynamic and Related Test Methods and Machines, Force-Deformation Relationships in Rubber Units, Resonance and Transmissibility, Practical Design Details, Use of Rubber in Engineering, Collaboration Between the Engineer and the Rubber Technologist, Properties of Vulcanized Rubber.

CONDUCTIVE RUBBER

by R. H. Norman $3.50

This book covers the production, application and test methods of and for conductive rubber. It surveys a whole mass of results and prevents the main conclusions in a form which can readily be used by the rubber manufacturer. It deals extensively with the conductive and anti-static classes of rubber. The effects of time, stress and other variables on resistivity are covered. A complete index is provided. One of the practical RABRM manuals.

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Financial News

Rubbermaid

► Nine months ended June 30: Net income amounted to $775,890, equal to 54c per share, compared with $1,292,239, or 90c per share, for the comparable nine-month period a year earlier. Net sales came to $19,955,777, against $20,498,443 for the nine months ended 1960.

Armstrong Rubber

► Nine months ended June 30: Net income amounted to $3,282,375, equal to $1.93 per share, compared with $3,272,454, or $1.92 per share, for the similar period a year ago. Sales were $87,346,013, against $80,939,325 for the comparable nine-month period ended 1960.

Witco Chemical

► First half: Net income totaled $1,585,900, equal to $1.05 per share, compared with $1,534,500, or $1.02 per share, for the corresponding period of the previous year. Sales and other income amounted to $51,147,800 against $47,827,500 for the first six months of 1960.

Stauffer Chemical

► First half: Net income amounted to $9,444,000, equal to $1.01 per share, compared with $10,820,000, or $1.15 per share, for the first half of 1960. Sales totaled $118,710,000, against $114,349,000 for the corresponding period a year ago.

Mohawk Rubber

► First half: Net income was $893,000, equal to $1.74 per share, compared with $626,000, or $1.21 per share, for the corresponding period of 1960. Sales amounted to $16,472,000, against $15,918,000 for the same six-month period last year.

New Jersey Zinc

► First half: Net income came to $1,021,787, equal to 52c per share, compared with $2,214,327, or $1.13 per share, for the first half of 1960.

Texas Butadiene

► First half: Net income amounted to $1,566,239, the equivalent of 58c per share of common stock. Sales totaled $20,398,408.

Glidden

► Nine months ended May 31: Net income was $3,386,279, equal to $1.47 per share, compared with $4,428,020, or $1.92 per share, for the corresponding period a year ago. Net sales amounted to $148,393,233, against $145,874,617 for the nine-months period in 1960.

Rohm & Haas

► First half: Net income amounted to $9,748,000, equal to $8.45 a share, compared with $12,256,000,000, or $10.65 a share, for the first half of 1960. Sales came to $110,540,000, against $116,217,000 for the comparable period a year ago.

Electric Storage Battery

► First quarter: Net income of $1,318,000, equal to 78c per share compares with $1,364,000, or 81c per share, earned in the first quarter of last year. Sales totaled $25,935,000, against $35,884,000 in the first three months of 1960.

American-Marietta

► Six months ended May 31: Net income was $6,310,854, equal to 44c per share, compared with $8,961,736, or 66c per share, for the comparable period in 1960. Sales totaled $157,230,234, against $160,915,599 for the six-month period a year ago.

Monsanto

►First half: Net income totaled $34,587,000, equal to $1.27 a share, compared with $38,363,000, or $1.41 a share, for the first half of 1960. Sales were $465,676,000, against $460,677,000 for the first six months of the previous year.

General Electric

► First half: Earnings amounted to $93,478,000, equal to $1.05 per share, compared with $111,429,000, or $1.26 per share, for the first half of 1960. Sales came to $2,074,425,000, against $2,022,699,000 for the corresponding period a year ago.

Dow Chemical

► Year ended May 31: Net income was $64,439,878, equal to $2.23 per share, compared with $84,328,906, or $3.02 per share for the fiscal year ended 1960. Net sales came to $817,514,653, against $810,845,250 for the comparable 1959-1960 period.

Goodyear

► First half: Net income totaled $38,471,677, equal to $1.13 per share, compared with $37,694,223, or $1.11 per share, for the first half of last year. Net sales amounted to $726,151,829, against $815,808,995 for the corresponding period of 1960.

Columbian Carbon

► First half: Net income came to $3,652,000, equal to $2.26 per share, compared with $4,026,000, or $2.49 per share, for the first half of 1960. Net sales amounted to $40,991,000, against $41,355,000 for the comparable period a year earlier.

U.S. Rubber

►First half: Net income was $13,703,327, equal to $1.93 per share, compared with $18,505,198, or $2.77 per share, for the same period a year ago. Sales amounted to $474,041,915, against $510,188,647 for the first six months of 1960.

United Engineering

► First half: Net income came to $2,617,538, equal to $1.02 per share, compared with $2,432,594, or 95c per share, for the first half of 1960. Sales reached $40,769,595, against $33,522,698 for the comparable period a year ago.

B. F. Goodrich

► First half: Net income amounted to $15,072,900, equal to $1.65 per share, compared with $18,177,093, or $2.02 per share, for the first six months of 1960. Net sales totaled $370,356,606, against $403,820,831 for the same period a year ago.

Montecatini

► First quarter: Net income amounted to $6,717,000, compared with $4,762,000 for the first quarter of 1960. Net sales totaled $118,257,000, against $96,927,000 for the same period a year ago.

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West Coast News

► The TLARGI Rubber Technology Foundation, sponsored by the Los Angeles Rubber Group, and the University of Southern California are sponsoring courses in rubber technology during the Fall semester at the university. A basic course in rubber technology is being offered for individuals new to the rubber industry or for those in allied fields who may benefit from a better understanding of the fundamentals of rubber polymers or of their use.

More advanced courses are being offered for persons engaged in development work where increased knowledge of rubber technology will be helpful. Additional information can be obtained from Dr. E. G. Partridge, University of Southern California, Los Angeles, Calif.

►The Western Section of the Society of the Plastics Industry, Inc., has elected J. Allen Carmien, president of New Plastic Corp., Los Angeles, as its 1961-1962 chairman. Mr. Carmien was vice-president of the SPI Western Section for 1960-1961. Other officers serving the SPI Western Section for the coming year are: *Vice-chairman*, Frederic M. Rea (Western Plastics Magazine); *Secretary*, Warren Buschmann (Union Carbide Plastics); *Treasurer*, Charles Wurdeman (Rezolin, Inc.).

► Stauffer Chemical Co., New York, N. Y., has opened its new main laboratory and administration building at its Richmond Research Center, Richmond, Calif. The 53,000 square foot building is the central unit of the complex of research buildings which the company is constructing on the 16-acre site. It houses 25 individual laboratories, a technical library, conference and meeting rooms, administrative offices, a lunchroom and other service facilities. The center conducts research on polymers, catalysts, agricultural chemicals, organic chemicals, inorganic chemicals, fluorine chemicals and analytical procedures.

Scott Verifies Gel Theory

► Dr. K. W. Scott, head of the basic rubber research section of the Goodyear Tire & Rubber Co., Akron, Ohio, has announced experimental verification of the widely-used Flory gel network formation theory. The report was made in a paper presented at the International Symposium on Macromolecular Chemistry, held on July 28 in Montreal, Quebec, Canada. According to this theory, the concentration of cross-links in an elastomer may be calculated if the molecular weight distribution and sol fraction — the amount of unlinked rubber left over after vulcanization, soluble in a solvent such as benzene—are known. If the dependence of sol fraction upon the number of crosslinks is known, the molecular weight distribution can similarly be calculated.

Dr. Scott and his colleagues conducted their studies on natural rubber, using dicumyl peroxide, which recently was found by Goodyear scientists to have the unique characteristic of being a quantitative crosslinker for natural rubber. Tests also determined the extent of previously unknown permanent molecular scission, or breakage, which might occur during the crosslinking reaction. The proportion of scissions to crosslinked units was found to be less than one-half of one per cent. Simple, rapid equations also have been set up for estimating molecular weight distributions from sol fraction-crosslinking studies.

Mobay Expands

► Mobay Chemical Co., Pittsburgh, Penna., will construct additional multi-purpose plant facilities for the manufacture of a broad range of organic isocyanates at New Martinsville, West Va. The addition will have a production capacity of several hundred tons per month. It will be located adjacent to Mobay's tolylene diisocyanate plant which is currently being expanded from 40 to 50 million pounds capacity per year. Completion of the new facility is scheduled for early 1962. The isocyanates produced by Mobay are used in the manufacture of Texin, Mobay's new urethane rubber compound, as well as in adhesives, protective coatings, pharmaceuticals, herbicides, and insecticides.

P. J. Mester

Named by Naugatuck

► Paul J. Mester has been named superintendent of reclaim and dispersion production for the Naugatuck Chemical Division of U. S. Rubber Co., Naugatuck, Conn. Mr. Mester, who has been manager of reclaim rubber research and development for Naugatuck Chemical since 1958, succeeds George M. Emery, who retired on June 30 after 40 years association with the rubber industry. In addition to his new assignment, Mr. Mester will continue to direct reclaim rubber research and development activities for Naugatuck Chemical.

In 1941, Mr. Mester received his B.S. degree in chemistry from Holy Cross College. After doing graduate work at the University of Pennsylvania, he joined Naugatuck Chemical in 1942 as a chemist in its Research and Development Department. Prior to leaving for military service in 1944, Mr. Mester had been promoted to supervisor of the analytical laboratory.

When he returned to Naugatuck from his military duty, Mr. Mester became a group leader in the testing service laboratories, and in 1953 he was named chief chemist for synthetic rubber production at the Naugatuck plant. The following year he became quality control chemist for both synthetic rubber and chemical production.

► The Elastomer Chemicals Department of DuPont, Trenton, N. J., has a new telephone number: TUxedo 2-8050.

► Dow Corning Corp., Midland, Mich., has available an eight-page manual titled "How Silicones Aid the Rubber Industry."

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Canadian News

► Dominion Rubber Co., Ltd., Montreal, Quebec, is manufacturing an all-weather tire, called the Tomarkin tire, which it claims will provide traction equal to that of a snow tire. Imperial Oil Co. of Canada, Ltd., will market the tire in Canada this Fall. It is reported that the tire will be sold as a premium product. The new tire was developed by Dr. Leandro Tomarkin, an industrial chemist entering the tire field for the first time. The Tomarkin tire is not a snow tire in the usual sense. It has a standard tread, but with tiny elastomeric particles compounded into it which are said to give the tire a skid-resistance on ice and in snow as good, or better, than that of the traditional winter tire.

Although the composition of the particles has not been revealed, Dr. Tomarkin reports that they are cubes about 3/32-inch in each dimension and are harder than the tread stock. They wear slightly faster than the tread stock, giving the tread an irregular surface. The particles are partly cured before they are incorporated with other ingredients of the tread stock in the last phase of milling. U. S. patents for the new all-weather tire are pending.

► The U. S. courts have recently awarded a patent on oil-extended type rubbers to the General Tire & Rubber Co., Akron, Ohio, a decision which affects several Canadian firms. Polymer Corp., Ltd., Sarnia, Ontario, has been making oil-extended rubber for several years, and a number of Canadian firms have been using it in their products, chiefly in automobile tires. Since the recent patent award is believed to cover use of the rubber in production only, Polymer is expected to be free from royalty payments. General Tire has indicated, however, that it will press its royalty claims against companies who have been using oil-extended rubber in the production of end-products. It is estimated that such royalties could bring around $3.9 million a year.

► Roland A. Harris, has been named vice-president of marketing at B. F. Goodrich Canada, Ltd., Kitchener, Ontario. Mr. Harris graduated from the University of Toronto with a B.A. degree in political science. He was associated with the Mackay group of companies in executive capacities for many years, serving as president of Walker Stores, Ltd. In 1958, Mr. Harris joined Canada Cycle & Motor Co., Ltd., and a year later became its president, the post he held until his present appointment.

► L. V. Lomas Chemical Co., Ltd., Downsview, Ontario, has been named exclusive distributor by J. M. Huber Corp., New York, N. Y., for its specialty kaolin clays and Zeolex synthetic silica pigments, in the provinces of Quebec and Ontario. Lomas will distribute the Huber line to the rubber paint, varnish, printing ink, plastics, and allied processing industries.

► The 18th International Congress of Pure and Applied Chemistry was held at the Queen Elizabeth Hotel in Montreal, Quebec, from August 6-12, in conjunction with the 21st Conference of the International Union of Pure and Applied Chemistry. Of particular interest to the rubber industry were the papers presented at the August 7 meeting of Section B-4: Plastics and High Polymers. Dr. K. J. Ivin (Leeds, England) and Dr. W. Kuhn (Basle, Switzerland), served as co-chairmen of the morning session, and Dr. P. Piganiol (Paris, France) and Dr. H. M. Spurlin (Wilmington, Del.) were co-chairmen of the afternoon session.

Papers delivered at the morning session were: *Sessional Lecture* "Relationship of Polymer Transition Temperatures to Chemical Structure" by R. F. Boyer (Dow Chemical); "The Properties of Polymeric Terephthalates from P - Phenylenedialkanols" by I. Goodman and J. W. Stimpson (Imperial Chemical Industries, England), presented by Mr. Goodman; "The Synthesis and Conformational Stability of Poly-L-Methionine and Certain Copolypeptides" by S. M. Bloom, G. D. Fasman, C. de Loze and E. R. Blout (Children's Cancer Research Foundation and Harvard Medical School, U. S. A.), presented by Mr. Bloom; "The Problem of Phase Structure in Polydisperse Polymers" by A. Broda (Lodzkie Zaklady Chemiczne, Poland); and "The Effects of γ-Radiation on the Gas Transmission Properties of Low Density Polyethylene Films" by H. J. Bixler, A. S. Michaels and M. Salame (Massachusetts Institute of Technology, U.S.A.), presented by Mr. Bixler.

The afternoon session heard the following papers: *Sessional Lecture* "Crystallization Phenomena in High Polymers" by H. A. Stuart (Mainz University, Germany); "Heterophase Conditions in Polymer Materials" by M. Kronstein (New York University, U. S. A.); "New Light Scattering Techniques: Application to Dilute Dispersions of Uniform Polystyrene Latices" by L. H. Sperling (Buckeye Cellulose, U. S. A.); "Vulkanisierung von Silikonen" by M. Schmidt, M. Wieber and O. Blattner (Universitat Munchen, Germany), presented by Mr. Schmidt; "Polymer Properties of Synthetic Polysaccharides and their Derivatives" by P. T. Mora (National Institute of Health, U. S. A.); "Branching in Polyacrylonitrile 11. Polyacrylonitrile Prepared in Ethylene Carbonate Solution" by L. H. Peebbles, Jr. (Chemstrand Research Center, U. S. A.); and "Vitrification Phenomena in Crystalline Polymers" by V. A. Karkin (Karpov Institute of Physical Chemistry, U. S. S. R.).

► General Tire & Rubber Co. of Canada Ltd., Welland, Ontario, has announced two sales appointments in the Toronto area. Peter J. Gingras has been named territory manager for the Western Toronto district, and Mr. Robert W. Morris has been named territory manager for the Eastern Toronto district. Mr. Gingras joined General Tire in 1948. He had served as kraft engineer for a period of five years and, most recently, held the position of assistant retread plant manager.

► Davis-Standard, a division of the Franklin Research and Development Corp., Mystic, Conn., has appointed John Kilgallon as Canadian field sales engineer for its wire and cable and plastic extruding machinery. Mr. Kilgallon graduated from St. Edwards College, Liverpool, England, and is an alumnus of the Government Technical Center, Manchester. For the past ten years, he has been project engineer for packaging film and plastics produced by DuPont of Canada Limited.

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Obituaries

Theron R. Palmer

► Theron R. Palmer, founder and chairman of the board of the Continental Rubber Works, Erie, Penna., died on July 5. He was 84 years old. Born in Edinburg, Ohio, in 1877, his interest in the rubber business started at the age of 16 after his graduation from high school when he went to work for the B. F. Goodrich Co. in Akron, Ohio. Seven years later, he joined the Pennsylvania Rubber Co. as general manager and supervised the building and equipping of its new rubber factory at Jeannette, Penna. In 1903, he resigned from Pennsylvania Rubber to start his own company, the Continental Rubber Works in Erie. In the beginning, Mr. Palmer's young company produced molded rubber parts, industrial hose, various calendered goods, and tires and tubes. The bicycle tire was the prime products in those early years.

Mr. Palmer served the firm as president and general manager until 1947 when he became chairman of the board, and Continental Rubber kept pace with the industrial change in the United States. One of his cardinal management principles was that skilled manpower was even more important to industrial success than machinery. Thus, Continental Rubber maintained a leading position in the development of both new and improved rubber techniques. Mr. Palmer leaves his wife, a daughter, and a son, Charles, a vice-president of Continental Rubber.

Moss Albert Kent

► Moss Albert Kent, a retired vice-president of the General Cable Corp. and of the Phelps Dodge Co., died of a heart attack on August 19 at his home in White Plains, N. Y. He was 69 years old. Mr. Kent was born in Syracuse, N. Y., and was graduated in 1914 from Princeton University. He was executive vice-president and director of manufacturing for General Cable until 1945. He took a leave of absence during World War II to serve on the War Production Board in Washington, D. C. In 1955, he became a vice-president of Phelps Dodge, and retired in 1960. Mr. Kent leaves his wife and a step-daughter.

Roscoe E. Burke

► Roscoe E. Burke, founder and chairman of the board of the Burke Rubber Co., San Jose, Calif., died of an apparent heart attack on August 7 at his home in San Jose. He was 62 years old. Mr. Burke, a native Californian, founded the firm which bears his name in 1942. Prior to starting his own firm, he had worked for two early tire firms in San Jose, Baumgardner Bros. and the Ray Fair Tire Service. During World War I, he served overseas as a crew chief with the American Air Service. After World War II, he was honored by the San Jose Chamber of Commerce for employment of handicapped war veterans in his firm. Mr. Burke guided the company from a two-man operation until it had grown to one of the West Coast's major producers of rubber and vinyl floor covering and molded rubber products for industry. Mr. Burke leaves his wife, two sons, and seven grandchildren.

Charles W. Halligan

► Charles W. Halligan, a staff member of the Rubber Manufacturers Association, Washington, D. C., and widely recognized expert on cost accounting, died on August 8 of a heart attack at his home in Massapequa, N. Y. Mr. Halligan was a graduate of Pace Institute of New York. A member of the RMA for 35 years, he served the association as treasurer from 1951 until his retirement earlier this year. At the time of his death, he was serving the RMA as a consultant. His work included supervision of the RMA's statistical, accounting and tax activities. Mr. Halligan is survived by his widow, two daughters and three grandchildren.

Earl Antrim

► Earl Antrim, an extruded goods cost estimater for the Yale Rubber Manufacturing Co., Sandusky, Mich., died of a heart attack on July 21 in Alpena General Hospital in Sandusky. He was 54 years old. A native of Yorktown, Ind., Mr. Antrim had been with Yale Rubber for nine years. He leaves his wife, two sons, two daughters, and nine grandchildren.

Vincent Madsen

► Vincent Madsen, managing director of plantations for the U. S. Rubber Co., New York, N. Y., died of a kidney ailment on July 23 in St. Vincent's Hospital, in New York City. He was 48 years old. Born in Brooklyn, N. Y., on November 26, 1912, Mr. Madsen attended New York University, graduating in 1932 with a master's degree in economics. He also studied at the Harvard Business School. Mr. Madsen joined U.S. Rubber as a junior auditor in 1937, after holding positions with several banks and trust companies. In 1938 he was sent to Sumatra as an accountant. He was there when the island fell to the Japanese in 1942, and was interned for three and a half years, along with other rubber company officials.

Following his release, he was assigned to the New York City headquarters of U.S. Rubber for a year, then returned to the Far East as chief accountant for the operations in Malaya. He became general manager of Malayan American Plantations, Ltd., and then head manager of P.T. United States Rubber Sumatra Plantations, both wholly-owned subsidiaries of U.S. Rubber. He was appointed managing director of the Plantation Division in 1955. In this post he managed the company's 87,000 cultivated acres in Malaya and Sumatra, with latex and shipping plants in the Far East, and storage and unloading facilities at North Bergen, N. J., New York City, and Los Angeles, Calif. Mr. Madsen leaves his wife, Esther.

R. K. Turner

► R. K. Turner, a vice-president of the Union Carbide Corp., New York, N. Y., died suddenly on July 18 at his home in Larchmont, N. Y. He was 59 years old. Mr. Turner graduated from the Massachusetts Institute of Technology in 1923 with a B.S. degree in chemical engineering. He received his M.S. degree in chemical engineering from M.I.T. in 1924. Mr. Turner had been with Union Carbide since 1924, when he joined the Union Carbide Chemicals Co. at Clendenin, West Va. He moved to Carbide Plastics in 1952 as a vice-president, and was appointed president of that division in 1957. He was elected a vice-president of Union Carbide in June of this year. He leaves his widow, a son, four daughters, and 14 grandchildren.

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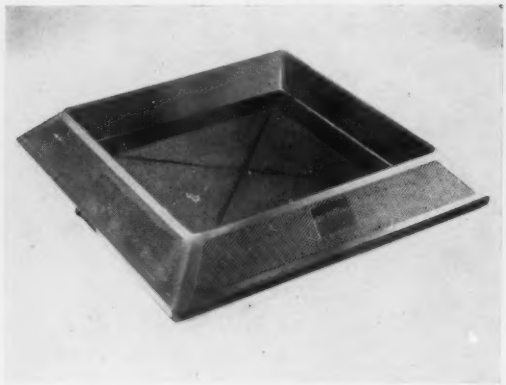
New Goods

Stokes Rubber Foot Bath

► A hard rubber foot bath, designed to fill the need for protection against contagious foot diseases, has been introduced by Stokes Molded Products, Taylor St. at Webster, Trenton, N. J. The foot bath is recommended for commercial and industrial uses, such as hotels, motels,



schools, industrial labs, pools, clubs, gyms, and industrial employee recreation facilities. The molded bath has a stippled bottom which capitalizes on the natural skid-resistance of rubber. There are no sharp corners or edges to cause possible injury. It is of one piece, corrosion-resistant construction, is easy to clean, light in weight, and is not affected by chlorine.

Crown Rubber Stair Tread

► A new household-weight rubber stair tread which looks like oak has been introduced by the Crown Rubber Co., 1615 Croghan St., Fremont, Ohio. The treads, called Wood-Tex, were developed to go with resilient floor tiles and planks. They are available in two styles: a curved nose style, and a double-duty style with riser. The riser style is made deep enough to assure coverage of most step and riser areas. Both styles come in shades of light and medium oak, and in widths of 18, 24 and 36 inches. The company states that they are installed by adhesive or tacks and are easily cleaned.

► A colorful, self-service, standing or hang-up display, the Qualatex Elephant Card, introduced by the Pioneer Rubber Co., 496 Tiffin Road, Willard, Ohio, holds two dozen 10-cent and one dozen 25-cent balloons, packaged in polyethylene packages. An equal number of balloons are provided with each card as a reserve load.

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AIDS PACKAGING, TOO. Syl-off coated paper and paperboard are gaining rapid acceptance for use in packaging sticky products . . . from asphalt to sweet rolls, from adhesive masses to candied fruits. Standard containers available with Syl-off coated liners or inner surfaces include multiwall bags, fiber drums, unit containers, cores and cartons.

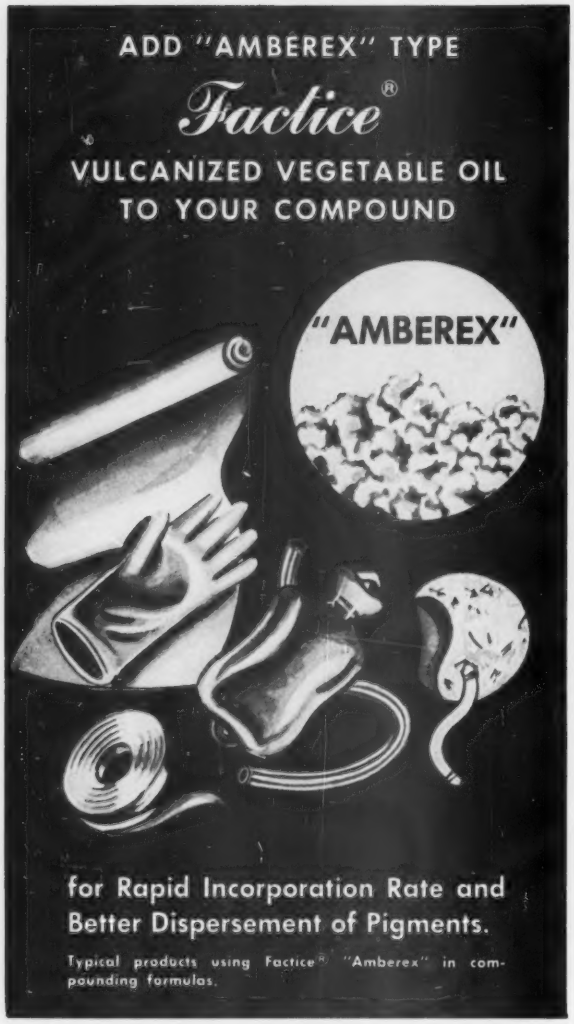
MORE ADVANTAGES. Syl-off coatings have natural nonoily lubricity and water repellency . . . won't migrate, contaminate or transfer . . . won't alter the characteristics of paper stock. Whether you process, ship or receive sticky materials, Syl-off coated papers are worth looking into. Write for a descriptive brochure and a complete list of sources for Syl-off coated paper. Address Dept. 8621a.

For complete technical information about any silicone product, contact the Dow Corning office nearest you.

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.



The Amberex type of Factice® is made from various kinds of vegetable oils and in various degrees of polymerization. All are light colored, transparent, free from chlorine and have practically no ash.

There are six different Amberex types, each having properties for specific applications. The selection of the proper Factice® for a compound is important. Send us your formula for our suggestions. All formulas held in strict confidence. Our trained staff will help in selecting the proper vulcanized vegetable oil for your need . . . Factice®, White, Brown, Neophax or Amberex.

THE STAMFORD RUBBER SUPPLY CO.
STAMFORD, CONN.

Mite-Site TV Antenna

► Mite-Site, an "invisible" television antenna designed to replace the unwieldy rabbit ears now in use, is being produced by RF Industries, Inc., Summit, N. J. The new antenna, which reportedly is effective for TV or FM radio reception, consists of a silver circuit printed on flexible B. F. Goodrich Koroseal vinyl—a material with a low dielectric for minimum RF resistance. Shaped liked two narrow butterfly wings, Mite-Site has a five-foot wing span but weighs only a quarter of a pound. It may be installed with thumb tacks wherever the purchaser chooses to locate it—on the back of a piece of furniture, behind draperies, under the rug, or in any concealed spot, according to the manufacturer. The circuit is printed in such a way that it can receive all TV channels and is said to eliminate the need for roof antenna, except in fringe areas.

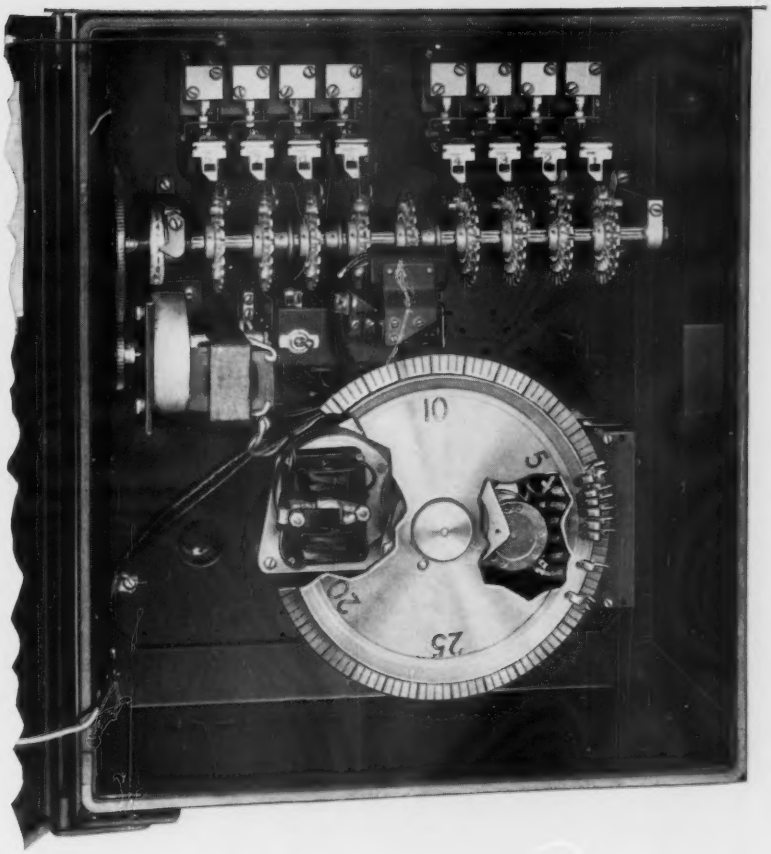
Essex Football Shoe Sole

► Essex Rubber Co., Chelsea, Mass., has introduced a new football sole named Football Leaguer Soles. They are constructed with seven cleats, five on the forepart and two on the heel, and are intended to simulate the bottom appearance of football shoes worn by college and professional players. Both sole and cleats are made of durable, molded rubber in order to prevent accidents from cuts, gouges and scratches. Each cleat is reinforced to withstand quick starts, turns, and sharp stops. Adaptable for hard or frozen surfaces, Football-Leaguer Soles are said to be unusually lightweight for greater speed. They are available in nine iron thickness, size 13 (Little Gents') through men's size 11.

► Twin mats, called Glam-R-Twins, designed especially for the sunken floor contours of 1961 General Motors cars, have been introduced by Ace Rubber Products, Inc., 100 Beech St., Akron, Ohio. The mats feature cut-out grips on the corners, making them easy to lift out of the car and empty without spilling, sliver mylar door-step plates, and deep-piled carpet texture molded into the toe-board area.

NOW...

no "coasting" on short time cycles



Special reset motor in Taylor FLEX-O-TIMER® Controller gives more accurate timing than ever before...

Timing and operator functions are now independently driven in the #350RJ series FLEX-O-TIMER Timed Program Controller. This latest improvement in the famous "Robot Brain" means even greater timing accuracy for the automatic press operation . . . particularly on short time cycles.

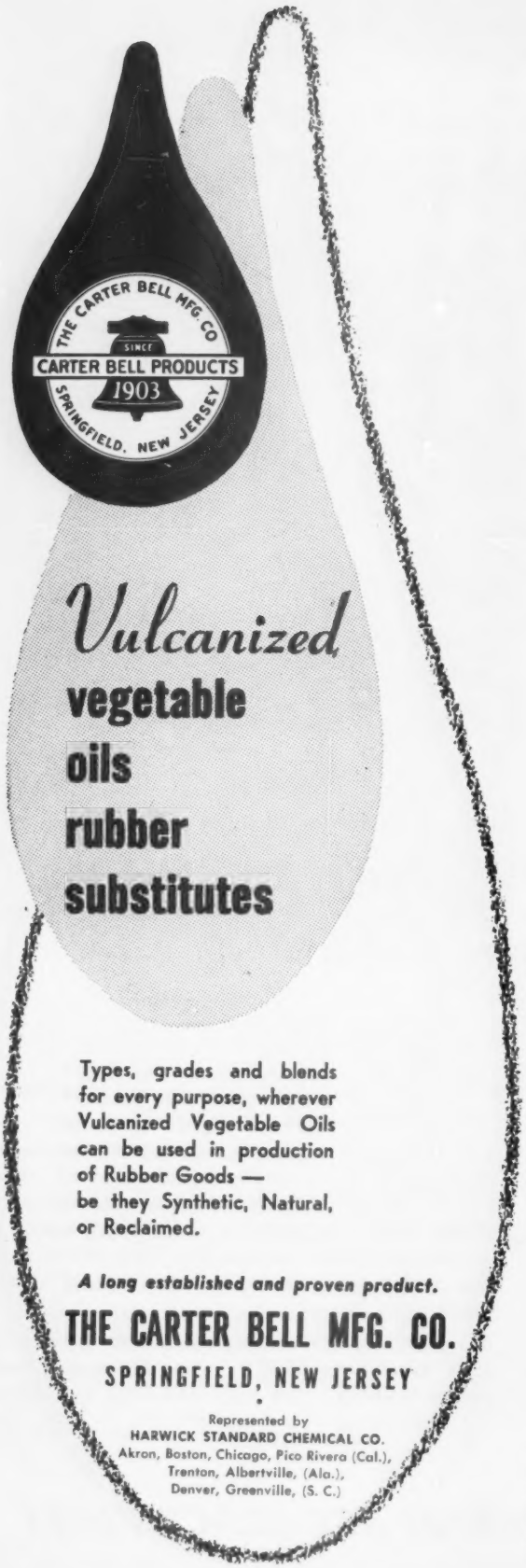
The new FLEX-O-TIMER Controller will handle up to 12 pneumatic and/or electric functions and gives you these plus features:

- Extremely short time intervals between steps (with high accuracy) can be accommodated . . . 7½ seconds on 30-minute cycle dial; minimums on other dials in same ratio.
- Cycle range is quickly adjustable for 15 to 60 minutes for high-speed range. 1 to 16 hours for low speed range.
- Time dial automatically resets to zero in maximum of 13 seconds at completion of cycle.

This is the ideal instrument for completely automatic time control for tire presses, particularly for nylon cord tires requiring additional functions; platen presses; or any process requiring precise timing of process sequence and duration involving temperature, pressure, mechanical motion, electrical energy, or any combination thereof.

Ask your Taylor Field Engineer for full details, or write for **Bulletin 98373.** Taylor Instrument Companies, Rochester, New York, and Toronto, Ontario.

Taylor Instruments MEAN ACCURACY FIRST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A long established and proven product.
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HARWICK STANDARD CHEMICAL CO.
Akron, Boston, Chicago, Pico Rivera (Cal.),
Trenton, Albertville, (Ala.),
Denver, Greenville, (S. C.)

Comar Tank Liner

► Tank liners made of heavy vinyl sheeting, designed to restore old chemical storage and processing vessels, are being custom-fabricated by Comar Plastics, Edison, N. J. The liners are made from Krene vinyl sheeting, said to be resistant to a wide variety of acid, alkaline and salt solutions, and some hydrocarbon systems. The company states that the physical condition of the tanks to be lined is unimportant—they must merely be strong enough to support the liquid load. They can be of practically any size or shape, with closed or open top, and with any number and size of inlets and outlets. In addition, little preparation of the tanks is required, since the vinyl liners are not bonded to the surface, enabling them to adapt to contraction and expansion of the tank. Another application for the liners, the company states, is the protection of a vessel in good condition that must be used temporarily in a service for which it is not suited. When the vessel is to be used again for its original purpose, the liner can be removed and stored for future use.

Pile-Driver Steam Hose

► A steam hose, designed for use in heavy construction and said to be burst-proof, crush-proof and resistant to the harmful effects of oil, has been introduced by the Manhattan Rubber Division of Raybestos - Manhattan, Inc., Passaic, N. J. The new Ray-Man HD-Pile Driver Hose is designed for saturated steam at pressures up to 200 pounds (366° F.), according to the company, for use in pile drivers, steam hammers, portable pumps, etc. The tube is of thick neoprene, lined with asbestos fabric and heavy gauge flat steel spirals. The strength member is two braids of high tensile, multiple strand, non-corrosive steel wire. The cover is oil-proof neoprene, which has high resistance to checking and abrasion, the manufacturer reports, while the special construction of the hose eliminates sloughing of tube and costly fouling of equipment.

Goodyear Rubber Bumpers

► Large rubber bumpers, originally designed as truck dock fenders by the Goodyear Tire & Rubber Co., Akron, Ohio, are being used as an additional safety device by racing enthusiasts at karting tracks. The bumpers add three and a half inches of rubber to the car's front to absorb possible collision shocks. Karting track operators report that maintenance costs have been reduced because damage to karts has been virtually nonexistant since installation of the bumpers. In addition, the flexible ends of the bumpers provide a measure of protection for the front tires.

Computreater #40

The Litzler Computreater, in its few brief years of existence has so capably filled the vital need for a high-precision laboratory scale cord treater, that it has been welcomed by fiber producers and tire, conveyor- and V-belt manufacturers everywhere. The fortieth unit has now been completed and shipped. If you would like complete data on the unit that is now setting world standards for both cord and impregnation processing, write . . .

C. A. LITZLER CO., INC.

SOUND ENGINEERING FOR TOMORROW'S PRODUCTION

235 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"

EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 2 BROADWAY, NEW YORK 4, N. Y.

LICENSED FABRICATORS: Benno Schilde Maschinenbau A. G., Bad Hersfeld, Germany; Soc. Alsacienne de Constructions Mecaniques, Paris, France; Mather & Platt, Ltd., Manchester, England

ATLAS Xenon Arc

Weather-Ometer® and Fade-Ometer®

A high pressure Xenon Arc with a spectral radiation distribution very close to that of sunlight is now available in the Weather-Ometer and Fade-Ometer.

This new Xenon light source is a 6000 watt water cooled lamp which at a sample distance of 18⅞ inches produces a rate of deterioration equal to that of noon June sunlight.

Both machines have automatic control of black panel temperature, cycles, etc. and are available with automatic control of humidity

The Xenon lamp is available with constant wattage transformers to insure a uniform radiation intensity regardless of variation in line voltage and controls are provided for increasing the wattage to compensate for loss of intensity due to lamp aging. Anticipated useful lamp life is 2000 hours. Lamp burner tube is easily replaceable by the operator.

Xenon Weather-Ometer®
$3457.00 up

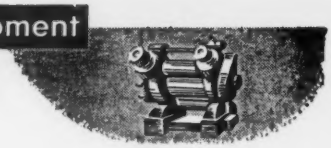
A new testing machine for fast determination of the weathering qualities of rubber products. Fully automatic operation. Sample capacity 54 specimens 3" x 9" in size. Weather-Ometers manufactured after 1953 can be converted from carbon arc to Xenon arc.

Xenon Fade-Ometer® $3247.00 up. For testing color fastness or light aging of rubber products. Fully automatic. Sample capacity 140 specimens 2¾ x 4¾ or 70 specimens 2¾ x 8 inches.

Write for complete information

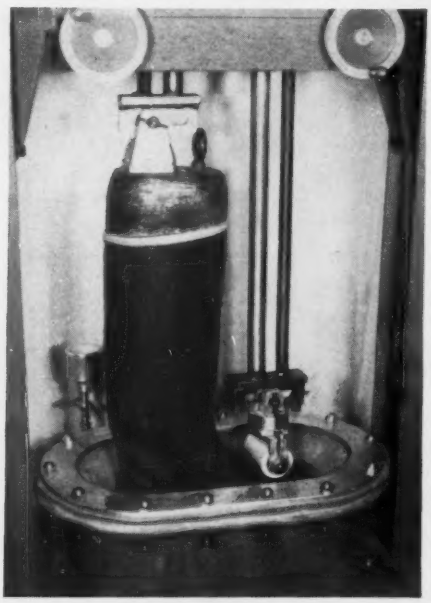
ATLAS ELECTRIC DEVICES CO.
4114 N. Ravenswood Ave., Chicago 13, Ill.

New Equipment



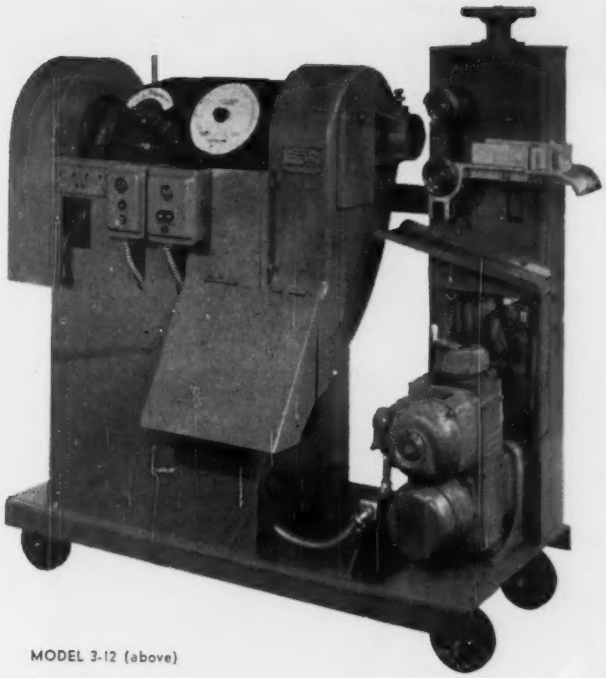
Circle Footwear Sole Press

► A footwear sole press, available from the Circle Machine Co., Inc., 18-36 Granite St., Haverhill, Mass., is fully air-operated by a common shop air line of about 90 pounds. The action is down and up, and the time cycle is controlled by an adjustable time dwell. The pressure head has a gear box, and each set of pressure bars is independently adjustable for



desired pressure. The pressure head can be adjusted for tall and low lasts and can be positioned in three height settings. The company states that the toe and leg contact pieces are also adjustable for all sizes from large to small shoes. The quick-change water boxes are double-diaphragmed, the larger compartment being at the bottom, and the small compartment placed between the lower and top diaphragms. Each compartment is equipped with a filling cup pet cock and vent cock. The machine is of cast aluminum for light weight and long life, and is mounted on casters for mobility. It measures 6 feet tall, 24 inches wide, and 20 inches deep.

► Hudson Bay Co., 3070 West Grand Avenue, Chicago 22, Ill., has added the Environ-Cab, a 4 cubic foot upright chamber to its line of temperature-humidity test cabinets. The unit has a temperature range of 0° to 200°F. with a control tolerance of ±2°F., and a humidity range of 20 to 95 per cent rh within ±5 per cent.



MODEL 3-12 (above)

Other Models Available:

Model 3-4, for 3" dia. x 4" length max.
Model 4-24, for 4" dia. x 24" length max.
Model 6-24, for 6" dia. x 24" length max.

NEWEST SLUG CUTTER

INCLUDES

Electric Length Calculator

Newest Goodman Rubber Slug Cutter, Model 3-12 delivers slugs up to 3" dia. and 12" long, at a rate of from 50 to 1200 per min. The electric Slug Length Calculator is built in, and computes correct cutter speed from feed rate and slug length desired . . . for 1 or more blades. Set up for cutting stock as it is extruded, coiling and stacking time is eliminated. Extreme accuracy of weight and tolerance is assured, as well as complete operator safety.

Write for Complete Information

Sales Representatives:

Ralph B. Symons Associates, Inc., 3571 Main Rd., Tiverton, R.I.
William A. Safka, 11 Sycamore Rd., Levittown, Pa.
R. A. Roosevelt Co., 4909 E. Florence Ave., Bell, Calif.

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NATURAL CRUDE RUBBER IN LIQUID FORM—100% SOLIDS

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...an important source of lead and zinc compounds for the rubber industry

Eagle-Picher offers you a comprehensive line of both lead and zinc compounds, produced with highest quality control standards to your exact specifications.

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4 REASONS FOR CHOOSING TAYLOR-STILES "GIANT" CUTTERS

1 A WIDE RANGE OF EFFICIENT SHEAR CUTTING DESIGNS

2 A COMPLETE SERVICE ORGANIZATION

3 OUTSTANDING INDUSTRIAL KNIVES

4 FREE SAMPLE CUTTING SERVICE

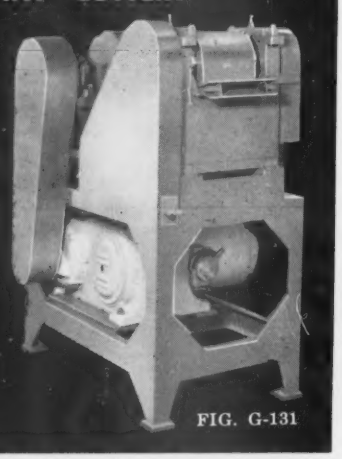
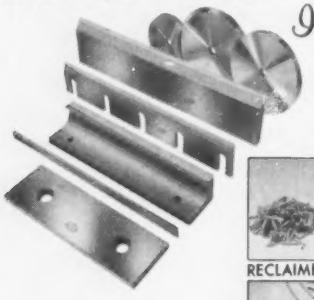


FIG. G-131

"GIANT" Pelletizers and Dicers with shear cutting action require less power to operate because the maximum force is applied at the cutting point. Positively controlled feed and varispeed motor allow instant change in pellet size if desired. In some cases, savings in power consumption alone have paid for the machine in several years. In addition, initial cost is usually much less since smaller horsepower motors are required. And you get additional savings from the high quality Taylor-Stiles industrial knives which stay sharp longer and require only simple bevel edge sharpening.

All GIANT CUTTERS are backed up by a complete engineering and service organization. These men are thoroughly familiar with all aspects of size reduction and industrial cutting machinery and are happy to aid and advise you on any questions you may have. Another of the services which Taylor-Stiles provides prospective customers is to cut some of their raw material so that they can see exactly what they will get before they buy a machine. If you desire this service, just send us a small sample of your product along with information as to size of pellet desired. Return the coupon today for free information on GIANT Cutters.



Industrial Knives

For rugged service in cutting tough, fibrous, abrasive materials — outstanding for endurance — require only simple, bevel-edge sharpening.

RECLAIMED RUBBER

UNCURED RUBBER

TIRES

TYPICAL CUT SAMPLES

Is your raw stock wet, oily, sticky, hot, crumbly, powdered? A wide range of material characteristics can be processed on "GIANT" Cutters!

GIANT

INDUSTRIAL CUTTING EQUIPMENT FOR PLASTICS, RUBBER, TEXTILE, PAPER AND OTHER INDUSTRIES: MACHINERY FOR BALE OPENING.

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COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

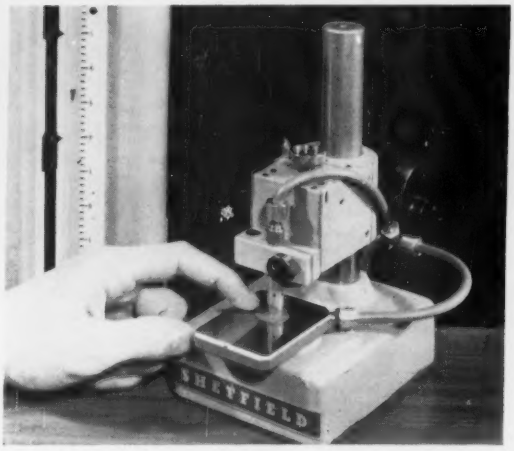
☐ I would like more information on free sample cutting services.
☐ I would like more information on your pelletizers.

TAYLOR, STILES & COMPANY

RIEGELSVILLE, NEW JERSEY • Phone: WYman 3-7191

Sheffield Thickness Gage

► A new thickness gauge, called the Precisionaire Non-Contact Thickness Gage, has been introduced by the Sheffield Corp., Box 893, Dayton 1, Ohio. Designed to measure the thickness of thin, fragile materials such as sheet rubber, plastic film, and semiconductor wafers and dice of germanium and silicone without gauge point pressure, the instrument literally floats the part in air



during gauging. The pressure-free operation is obtained by means of opposed air jets—one in the head and the other in the anvil. The air flowing out of the jets calipers the part to give accurate, repeatable thickness readings, indicated by the position of the float in the Precisionaire column. The gauge head is adjustable from .0001-inch to four inches. Two standard models are available—Model No. 604-TGF, with foot pedal to turn the air on and off, to facilitate loading thin materials into position, and Model No. 604-TFC, without foot pedal, so that air flow is continuous.

TMI Dead Weight Micrometer

► A dead weight motorized micrometer, said to assure that the dead weight measuring load is always applied in the same way and with exactly the same psi pressure, is being marketed by Testing Machines, Inc., 72 Jericho Turnpike, Mineola, L. I., N. Y. Measuring anvils are lapped flat stainless steel with the lower anvil adjustable with three lock screws to obtain exact parallelism of operator to freely handle the sheet and write the measuring surfaces. The cam which lowers the dead weight measuring load, loses contact with the load during the dwell period when the measurement is being noted, permitting only the dead weight to exert pressure on the sheet. The motorized feature of the micrometer enables the down the readings.

WHERE MILEAGE BEGINS:

A784

A Francis Shaw 8" heavy duty Rubber Extruder fitted with a die-head for the production of tyre treads. This machine can be fitted with various types of die-heads.

This is a Francis Shaw R.8 rubber extruder, fitted with a die-head for making tyre treads . . . the product of this machine will ensure safe transport for millions of people, for millions of tons of goods, over millions of miles of the world's roadways.

Built into this machine are reliability, precision economy in operation, simplicity with sensitivity of control, and rugged endurance over years of service. These properties are the result of long co-operation between Francis Shaw and tyre manufacturers; research in Francis Shaw laboratories; skilled design and quality engineering.

✳ Francis Shaw rubber extruders can be supplied with various types of die-heads —for the extrusion of solid section, tubing, sheeting, and for cable covering. • Barrels and die-heads are bored for steam heating and water cooling. • Screws, also water cooled, are made of hardened and polished alloy steel. • Driving heads and gears are designed to avoid vibration and deflection. • Variable speeds are available as standard.

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OVERSEAS AGENTS THROUGHOUT THE WORLD

P6151

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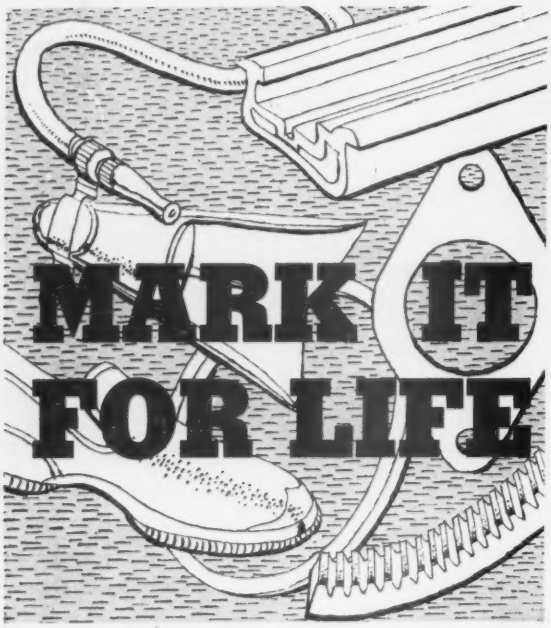
or
uncured



with a transfer

Mark rubber for life? Yes!

Through carefully controlled processing, Kaumagraph has developed two types of transfers for the rubber industry — one to be applied to uncured rubber, the other, for application to cured rubber.

You put your brand or identification on your product for the lifetime of your product. You do it easily in bright colors, completely legible, and at low cost.

Write for Free Samples and Details

KAUMAGRAPH COMPANY

wilmington 99, delaware olympia 4-2461

Offices: Boston, Chicago, Greensboro, Philadelphia, New York

Femco Splitting Head

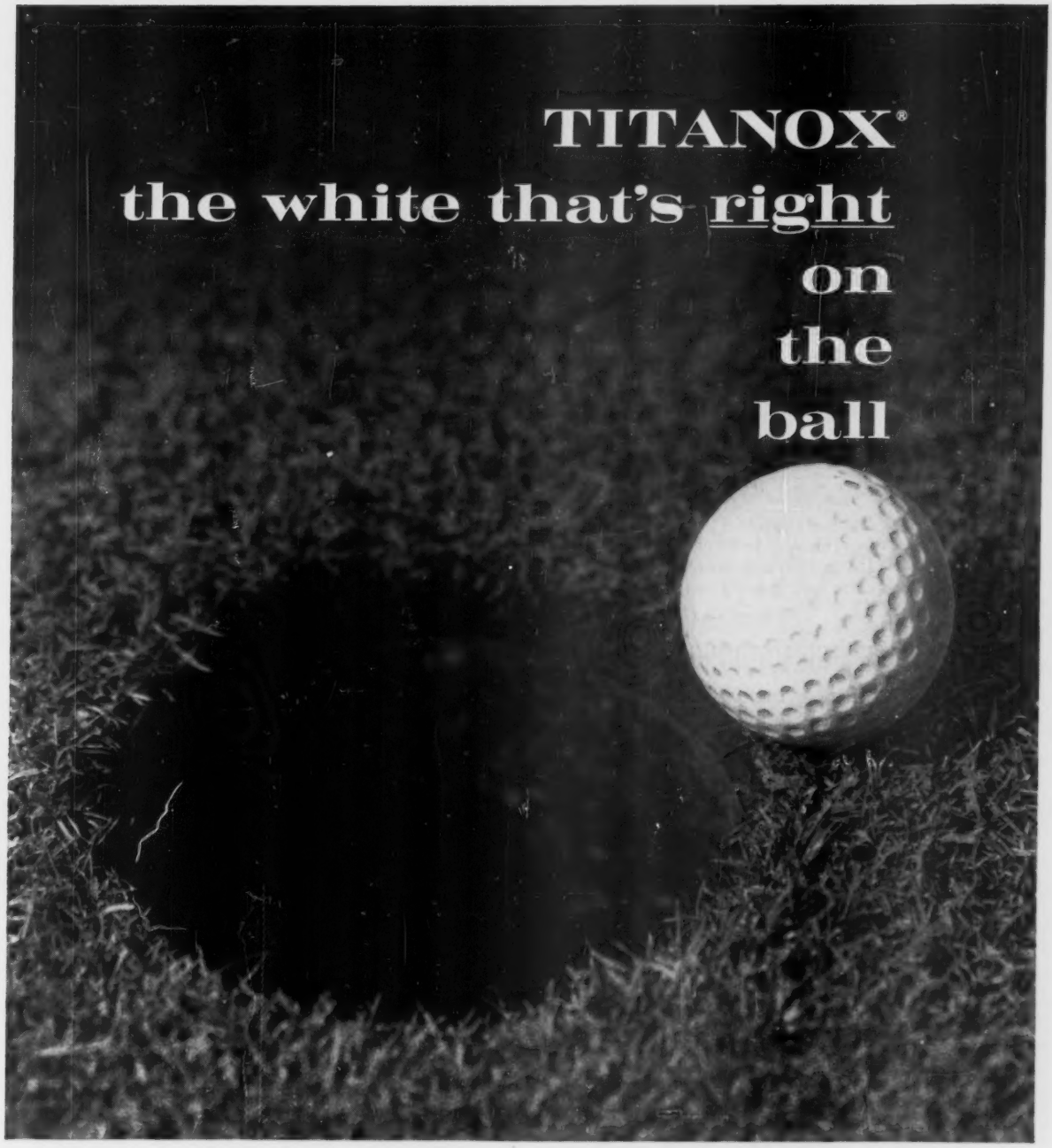
► A Universal Splitting Head that can be used to cut rubber and bonded latex, and to split and level blocks of plastic foam as thick as 42 inches has been developed by Femco, 1734 Front St., Cuyahoga Falls, Ohio. The splitting head will split either rigid or flexible foams and can be used singly or in series along existing conveyor systems. Clearance over the knife bar is 12½ inches. The cutting knife is adjustable from ¼-inch to 42 inches above the conveyor surface and is raised or lowered by a manual hand crank or an optional automatic indexing mechanism. Other optional equipment includes a motorized blade sharpener, a take-away wind-up conveyor, swivel mounting brackets, and a vertical and horizontally adjustable compression roll assembly. The splitting head is available in 50, 60, 72 or 80-inch standard widths. Special widths are available on request.

Torsion Two-Dial Balances

► Weight-loading balances equipped with two dials, one for weight loading and one for fine weighing, are available from the Torsion Balance Co., Clifton, N. J. The company reports that precision weighing of materials for delicate experiments has been speeded up by 20 per cent. The balances are being used to weigh out ingredients for preparing experimental styrene - butadiene latices, including monomers, emulsifiers, catalysts and buffers. With the balances, laboratory technicians can weigh up to 500 grams, including beaker, to 0.1g. The balances have been found to be accurate to 0.05g., according to the company. They are said not only to permit faster loading and weighing, but also to minimize inaccuracies arising from rough handling of weights, or human error in noting denominations of small, loose weights.

Flexible Tube Cutter

► A cutting machine which cuts to length fabric-covered, steel-wired flexible tubing is being manufactured by the General Development Corp., 117 Mulberry Street, Trenton 9, N. J. The machine is adjustable for many tube diameters. The tubing is hand fed and the unit operates either by foot or hand switch. In operation, a pair of wire cutting blades penetrate the cloth from beneath, cut the wire and move it out of the way of the band knife blade which cuts down from above. As a safety feature, when the machine is in motion without a tube in place, or when the wire cutters have not performed their operation, the band blade does not move through its cycle.



To give their products outstanding visibility on the fairway and at the sales counter, golf-ball manufacturers rely, among other things, on an unbeatable threesome that includes the right compounding ingredients, the right vulcanizing conditions and the right TITANOX pigments.

These white titanium dioxide pigments are ideal for whitening and brightening golf balls—from the raw material used for cover stock to the final bright coating applied to the finished ball.

As it is with golf balls, so it is with a wide range of other rubber and plastic products—there's a TITANOX white pigment to do the job efficiently. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y. In Canada: Canadian Titanium Pigments Ltd., Montreal.

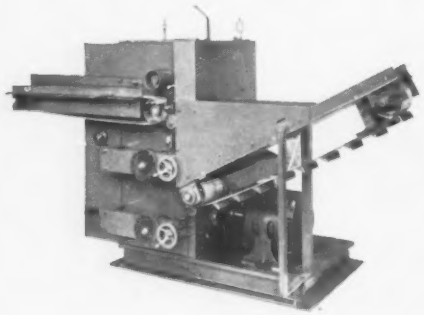
TITANIUM PIGMENT CORPORATION

SUBSIDIARY OF NATIONAL LEAD COMPANY

8003

CUTTING MACHINE

For Molding Preparation
Where High Production is Required



Capacity: Up to 3" OD
Lengths: 1/4" to 6"
Up to 2000 cuts per Min.
Continuous feed direct from Extruder

UTILITY MANUFACTURING COMPANY
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Now! — a HEAVY DUTY, PORTABLE
RUBBER STRIP-CUTTER

EASTMAN
MODEL RS-75
STRIP-CUTTER

cuts strips 1/8" to 10" wide
from slabs up to 2 inches thick
and up to 95 durometer hardness.

Guide may be removed to use the machine for cutting larger sections from slabs.

This newly developed strip-cutter, powered by a compact one-horsepower motor, makes it simple and easy to cut perfectly square strips within .010". Blade edge and gauge are continually moistened for easy cutting. Knife is automatically sharpened while cutting. Many other fine features.

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Skivers, Straight-Knife and regular Round-Knife machines also available.

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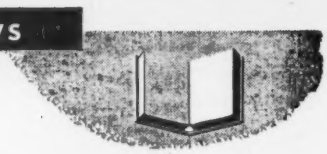
Tel: Area Code 716 TL6-2200 **BUFFALO 3, N. Y.**

Reviews



Introduction to Petroleum Chemicals. Edited by H. Steiner. Published by Pergamon Press, Inc., 122 E. 55th St., New York 22, N. Y. 6 x 9 in. 200 pp. $8.00.

This survey is based on a series of lectures given at the Manchester College of Science and Technology in 1959 by chemists and chemical engineers engaged in industry in England. Thus the English orientation of the industrial procedures and practices described here presents an interesting contrast to those in the United States, to which the authors of the individual chapters sometimes have occasion to refer.

Within the last thirty years, the synthetic organic chemical industry has undergone considerable change, with petroleum gradually replacing coal as the raw material for synthesis: thus this volume. In the introduction, Sir Robert Robinson states that the essays here give "an excellent idea of the directions of recent progress . . . It is safe to say that a major development of the next few years will be in the elastomer field."

The topics covered in the eight chapters (all of which are carefully footnoted, charted, and referenced, and which, in uniformity, reflect the work of a very competent editor) range from general processes to specific products. Company affiliations represented by the authors are equally varied. A listing of these, and the chapters in the book follow:

Cracking Processes for Olefins (I.C.I. Heavy Organic Chemicals Ltd.); Separation Processes for Olefins (Petrocarbon Developments Ltd.); Products from Ethylene and Propylene (The Distillers Co. Ltd.); Polymers from Ethylene and Propylene (Petrochemicals Ltd.); The Production and Use of Butadiene (Esso Research Ltd.); Aromatics from Petroleum (Shell Chemical Co. Ltd.); Styrene and Polystyrene (Rubber Regenerating Co. Ltd.); Acetylene from Hydrocarbons (British Oxygen Research and Development Ltd.); and Carbon Black (Cabot Carbon Ltd.).

Like any such compilation the inherent limitations of this one are apparent: differences in approach by the specific authors, differences in the depth of their treatment and explanations, and differences in their style and presentation. But as a survey of many of the important aspects of the field, the volume has merit.

•

Trade Names of Rubbers, Resins, and Plastics. Vol. III. By A. B. Davey. Published by Rubber and Plastics Research Association of Great Britain, Shawbury, Shrewsbury, Shropshire, England. Soft-bound, 8¼ x 11¾ in. 242 pp. $10.00.

Together with the two previous listings, this volume gives a comprehensive survey of the subject field from June 30, 1926 to December 31, 1959. This volume covers the five year period from 1955-1959. In its organization, one single alphabetical list is given of substitutes for natural rubber, of synthetic rubbers, and of synthetic resins or plastics. All these terms are interpreted broadly by the compilers. The names given include registered trademarks and trademarks for which applications have been accepted. The volume also lists coined words and "fanciful terms."

The publisher wisely points out that this volume is an addition to Volumes I and II, and not a revision of them. For complete accuracy, the three reports must be used in conjunction. Information has not been repeated here from previous listings except where new details have been made available.

Sources of the compilation credited include "RABRM

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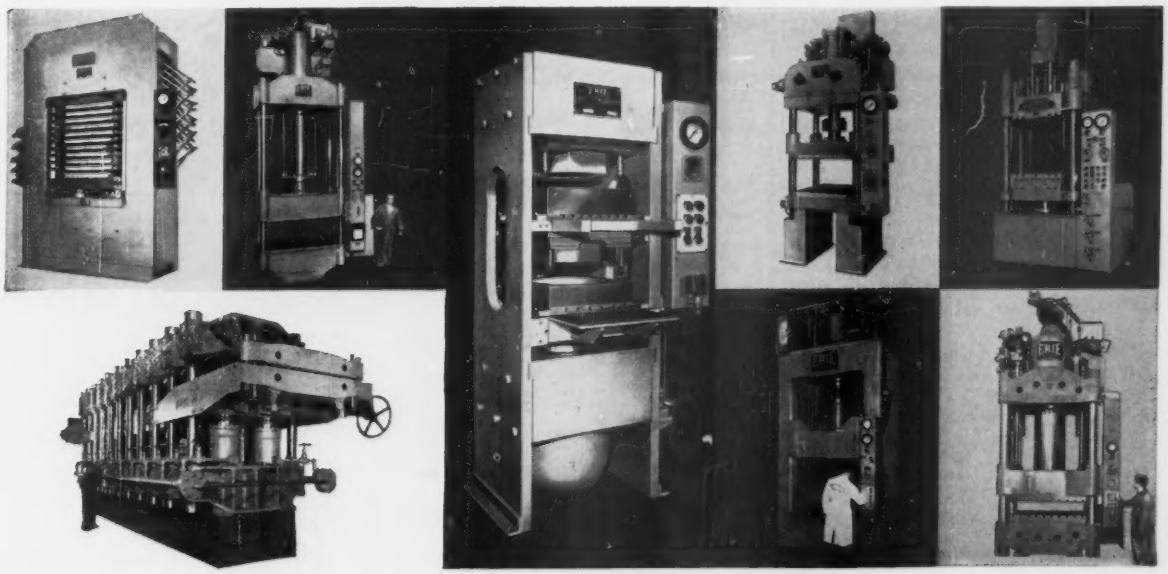

Trade Mark Review," "British Plastics Year Book," RUBBER RED BOOKS, and "Modern Plastics Encyclopedia." In quite a large number of entries, the sole source of information obtained has been the official trade mark journals of various countries. As in any such compilation, the publisher cannot guarantee the reliability of information in the original sources.

Within these limitations, it would seem that the Rubber and Plastics Research Association of Great Britain has performed a real service to those working in these fields.

BOOKLETS, CATALOGS, etc.

Rubber and Plastics Machinery. (Hydraulic Section, Edition No. 23.) Stewart Bolling & Co., Inc., 3190 East 65th St., Cleveland 27, Ohio. 8½ x 11 in. 32 pp.

Part 1, the Hydraulic Section, of this latest edition of the Bolling catalogue, describes the company's range of hydraulic presses, pumping units, elevators, bale cutters, and vulcanizers. The bolt-type mat presses described are recent additions to the line. Of particular interest is the new Bolling breech block. This is a new development which is said to shorten press packing maintenance time, lengthen packer life, and protect the press ram from scoring. "C" frame or open-side presses are also described. In addition, the illustrated catalogue contains a table which indicates capacities of hydraulic rams for various diameters and pressures.

Hycar Rubber and Latex: Resistance of Hycar Rubber to Immersion Media. (Manual HM-6, August, 1960.) B. F. Goodrich Chemical Co., 3135 Euclid Ave., Cleveland 15, Ohio. 8½ x 11 in. 16 pp.

This manual presents the results of a general immersion study showing the effect of immersion of typical Hycar 1001 and 1002 vulcanizates in industrial chemicals. A table provides detailed information on volume change of vulcanizates in many types of immersion media. Physical appearance of the samples at the end of the test is also shown. Additional tables show the effect of industrial chemicals, including oils and solvents, and the effect of aromatic fuels, including commercial refrigerants, on Hycar vulcanizates.

•

Building Firestone Tires. Firestone Tire & Rubber Co., Akron, Ohio. 8½ x 11 in. 16 pp.

This illustrated brochure describes the steps in manufacturing tires, starting with the gathering of the natural rubber and the production of synthetic rubber and the various tire components, and ending with tire assembly and final inspection. A brief outline of the development of the tire manufacturing process at Firestone and of the range of the company's products is included.

•

Chemistry of Lactonitrile. Petrochemicals Department, American Cyanamid Co., Bound Brook, N. J. 8½ x 11 in. 16 pp.

Applications, reactions with various compounds, and chemical and physical properties of this bifunctional intermediate are described. Over twenty classic reactions of lactonitrile are discussed and, wherever known, applications for reaction products are mentioned. A complete bibliography is also included.

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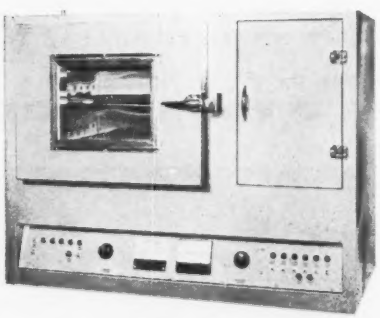
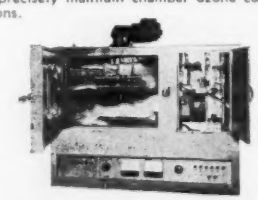
General Tire & Rubber Co.
B. F. Goodrich Research Center
Goodrich Gulf Chemical Co.
Goodyear Tire & Rubber Co.
General Motors Corporation
Phelps Dodge Corporation
Phillips Chemical Co.
Texas U.S. Chemical Co.
TLARGI, U.S.C.
U. S. Rubber Company
Shell Chemical Corporation



Orec 0300 Series employ an *electronic-chemical loop feed back servo system to achieve and precisely maintain chamber ozone concentrations.



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ROARING TWENTIES

Way back in the days of flasks, flappers and Model T Fords, we started making Stearic Acid for the rubber industry. Cake form proved as cumbersome as a coonskin coat. So we pioneered Stearex Beads. Better — but still not the ultimate answer. Then, so help us, we up and hydrogenated it under the name

CENTURY HYDREX® 440

Today when you buy a bag of this stuff, you've really hit the jackpot so far as quality is concerned. It makes better products with better shelf and use life. Natural result? Better sales!

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CHEMICAL MATERIALS CATALOG
Pages 159-161 for data.

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MARKET REPORTS

TRENDS
NEWS
PRICES

NEW YORK, SEPTEMBER 1, 1961

Natural Rubber

The price of natural rubber on the New York Commodity Exchange moved in a range of 125 points since our last report (August 1), high for the period being 30.63c reached on August 25 and 28, and low being 29.38c reached on August 1, 2 and 3. The average price of spot rubber for the month of August was 30.05c based on 23 trading days. This compares with an average of 29.46c in July.

Things in the rubber market have been rather quiet, according to analysts at Merrill Lynch, Pierce, Fenner & Smith. Interest in futures trading has seldom exceeded 20 lots in the past few weeks and quite a few sessions saw less than ten lots change hands. Despite this, futures have managed to advance about half a cent since the last report. Thus about 1.5c have been added to prices during the past six weeks. Prices are presently hovering around the G.S.A. minimum sales price. This has the effect of making buyers rather hesitant in taking on new commitments.

Effect of Berlin Crisis

The Berlin Crisis has had almost no effect on this commodity. The fact that the 80-day cooling off period in the Maritime strike is running out has also been ignored. What has been paid attention to, however, is the renewal of rumors of G.S.A. sales of deteriorating rubber at less than 30c. This time the reports came from London. The figure mentioned is 15,000 tons, but official Washington sources have had no comment yet.

Reports from Singapore indicate that a good amount of hedge selling is going on especially since the nearby positions are selling at a discount. Contributing to this activity is the poor statistical position displayed by rubber in this area of the world.

Malayan Rubber

July production of Malayan rubber was expected to show an amount of between 67,000 to 69,000 tons, up from 62,130 tons in June. Imports into Singapore continue to increase and the relatively unchanged demand may result in an increase of unsold stocks to approximately 142,000 to 145,000 long tons.

Quite a bit is being made of the fact that the U. S. market is the only one where No. 1 RSS is selling at a premium compared to forward dates. On the other hand, mention is made of the upward trend in low grade prices. As No. 1 RSS is neglected, good interest is centered in the lower quality rubber and they are thus able to display a certain amount of strength in an otherwise quiet market.

Price Data

Closing Rubber Prices on New York Commodity Exchange

AUGUST 1 TO AUGUST 31

Aug.	Spot	Sept.	Nov.	Jan.	Sales
1	29.38	29.30	29.05	28.90	25
2	29.38	29.20	29.10	28.95	2
3	29.38	29.40	29.10	29.05	19
4	29.63	29.50	29.35	29.25	12
5	....	....	....	....	..
6	....	....	....	....	..
7	29.88	29.77	29.50	29.45	16
8	29.88	29.90	29.60	29.45	26
9	29.75	29.89	29.55	29.30	21
10	29.63	29.80	29.55	29.25	7
11	29.63	29.75	29.40	29.15	8
12	....	....	....	....	..
13	....	....	....	....	..
14	30.00	30.05	29.70	29.50	5
15	30.00	29.95	29.70	29.45	16
16	30.00	30.25	29.90	29.70	31
17	30.25	30.40	30.10	29.80	10
18	30.13	30.30	30.00	29.60	12
19	....	....	....	....	..
20	....	....	....	....	..
21	30.50	30.50	30.10	29.80	13
22	30.50	30.50	30.25	29.90	19
23	30.25	30.15	29.95	29.50	27
24	20.38	30.40	30.10	29.75	11
25	30.63	30.50	30.25	30.05	31
26	....	....	....	....	..
27	....	....	....	....	..
28	30.63	30.40	30.30	30.05	9
29	30.38	30.25	30.20	29.95	3
30	30.50	30.35	30.35	30.15	18
31	30.50	30.45	30.25	30.15	20

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.30½
Sept.	.30⅜
Oct.	.30¼
Thin Latex Crepe:	
Spot	.33
Thin Brown Crepe, No. 2	.28¼
Flat Bark Crepe	.22¼

London Market
(Standard Smoked Sheets)

Oct.	29.97 — 30.11
Dec.	30.11 — 30.40

Singapore Market
(Standard Smoked Sheets)

Oct.	28.69 — 28.78

Middling Upland Quotations

	July 31	August 31		
	Close	High	Low	Close
Oct.	34.47	34.49	34.48	34.48
Dec.	34.96	35.03	35.01	35.02
Mar.	35.66	35.72	35.70	35.68

Notes & Quotes

A massive growth in the national economy is coming in the 1960's but many businessmen must change their methods of doing business, says Don C. Miller, vice-president, marketing of the B. F. Goodrich Co. Mr. Miller lists three trends: (1) An increase of nearly 9 million adults in the 18-24 age bracket; (2) An ever-increasing flow of new products, and (3) an increase in government expenditures.

Synthetic Rubber

The ratio of synthetic rubber consumption to total new rubber consumption hit a new high in July with a figure of 72.20 per cent. The previous high of 72.10 per cent was reached in the previous month. In the first seven months of the current year, a total of 769,463 long tons of all types of synthetic were produced and 595,611 long tons consumed. This compares with 875,839 and 646,364 long tons, respectively, in the first seven months of 1960.

The export situation continues to be of some concern. As new foreign plants get into production, exports of synthetic from the United States continue to slide. United States exports of synthetic rubber this year are expected to decline to about 320,000 long tons from 1960's record 340,000 long tons.

Much of the new foreign capacity is owned by United States companies. As one executive in the United States puts it: "We are exporting know-how instead of rubber."

Goodyear Optimistic

However, at least one major producer, Goodyear, believes that its share of the future export market will remain fairly close to present levels despite the anticipated over-all drop. R. S. Earhart, manager of the Chemical Division of the Goodyear International Corp., points to the availability of "special grade" synthetic rubbers from the company.

Within the past few months, Mr. Earhart indicated, a $1.3 million installation for processing high purity, special-grade SBR has gone into operation. Many foreign producers, he said, even those with plants now under construction, do not have the capacity to produce economically a wide variety of both general purpose and special grade rubbers.

A producer such as Goodyear, with a jump of 20 years on foreign competitors, has acquired the experience and developed processing techniques that permit production of special grade rubbers at prices competitive with those of standard synthetics, he continued.

Foreign Limitations

The result, at least for the time being, he believes, will be the limitation of foreign synthetic production to the more conventional types that are used primarily in tires. In certain areas of use—shoe products, plastics, wire and cable and other applications—there is increasing demand for synthetic rubbers with special inherent qualities and properties. This situation applies not only to American end-product manufacturers but to those located abroad, he declared.

Call Hall

HALLCO NEWS

Issued by
The C. P. Hall Co.
Chemical Manufacturers

No. 12

SAVE UP TO 30% WITH LE-46 RUBBER MOLD RELEASE AGENT

Tire and mechanical goods manufacturers report savings up to 30% by using LE-46, the high viscosity silicone oil emulsion release agent. LE-46 gives a more substantial, stable, and durable film at mold temperatures. It also lends itself to automatic spray equipment because it "flats out" far better than other rubber mold release agents. LE-46 is manufactured by the Union Carbide Corporation, Silicones Division, and is distributed by The C. P. Hall Company. Samples available on request.

LOW TEMPERATURE PLASTICIZER FOR VINYL AND RUBBER

Dioctyl Azelate C-498 is an ester-type technical grade plasticizer. It is low in volatility and in water extractions. C-498 provides excellent light and heat stability and is highly recommended for use with calendered films, sheets, coated films, dispersions, plastisols, and extrusions. Manufacturers' reports show it is ideal as a softening agent for synthetic rubbers, especially the nitrile type. Manufactured by The C. P. Hall Company. Samples available on request.

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Phone	Phone	Phone	Phone	Phone	Phone
JEfferson	POrtsmouth	JAckson	SPruce	FAirfax	Mitchell
5-5175	7-4600	6-8253	5-6666	0-2211	3-2614

PRICES OF COMMERCIALLY AVAILABLE

Dry Rubber

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene NF	.4900	1
Butaprene NH	.6500	1
Butaprene NL	.5000	1
Butaprene NXM	.5800	1
Chemigum N3NS and N5	.5800	2
Chemigum N6	.5000	2
Chemigum N6B and N7	.5000	2
Chemigum N8	.5000	2
Chemigum N600	.5000	2
Herecol N-33	.6800	2
Hycar 1001 and 1041	.5800	2
Hycar 1002	.5000	2
Hycar 1014	.6000	2
Hycar 1042 and 1043	.5000	2
Hycar 1051	.5800	2
Hycar 1052	.5000	2
Hycar 1053	.5000	2
Hycar 1072	.6400	2
Hycar 1203	.4600	2
Hycar 1312	.5000	2
Hycar 1411	.6200	2
Hycar 1432	.5900	2
Hycar 1441	.6200	2
Paracril AJ	.4850	2
Paracril B and BJ	.5000	2
Paracril BLT and BJLT	.5000	2
Paracril C and CLT	.5800	2
Paracril CV	.6300	2
Paracril D	.6500	2
Paracril 18-80	.6000	2
Paracril OZO	.4600	2
Polysar Krynac 800	.5000	1
Polysar Krynac 801 and 805	.5800	3
Polysar Krynac 802	.5000	2
Polysar Krynac 803 and 804	.5000	3

Butadiene-Styrene Types

Ameripol 1002	.2435	2
Ameripol 1006	.2410	2
Ameripol 1006 (crumb)	.2475	2
Ameripol 1007	.2410	2
Ameripol 1009	.2475	2
Ameripol 1009 (crumb)	.2590	2
Ameripol 1011	.2475	2
Ameripol 1012	.2425	2
Ameripol 1012 (crumb)	.2490	2
Ameripol 1013	.2410	2
Ameripol 1013 (crumb)	.2615	2
Ameripol 1500 and 1501	.2410	2
Ameripol 1502	.2410	2
Ameripol 1509 and 1511	.2410	2
Ameripol 1000 and 1001	.2410	2
Ameripol 1605	.1900	2
Ameripol 1606	.1820	2
Ameripol 1608	.1845	2
Ameripol 1609	.2080	2
Ameripol 1610	.1870	2
Ameripol 1703	.2060	2
Ameripol 1705	.2035	2
Ameripol 1707	.1910	2
Ameripol 1708	.1910	2
Ameripol 1710	.1885	2
Ameripol 1712	.1885	2
Ameripol 1805	.1550	2
Ameripol 1808	.1480	2
Ameripol 1809	.1545	2
Ameripol 1810	.1400	2
Ameripol 4600 and 4601	.2410	2
Ameripol 4604	.2410	2
Ameripol 4651	.1770	2
Ameripol 4659	.1820	2
Ameripol 4660	.1870	2
Ameripol 4664	.1845	2
Ameripol 4667	.2080	2
Ameripol 4700	.1750	2
Ameripol 4756	.1545	2
Ameripol 4758	.1450	2
Ameripol 4759	.1598	2
Ameripol 4760	.1576	2
Ameripol 4761	.1710	2
ASRC 1000	.2410	2
ASRC 1001 and 1004	.2410	2
ASRC 1006	.2410	2
ASRC 1009	.2475	2
ASRC 1018	.2700	2
ASRC 1019	.2650	2
ASRC 1500 and 1502	.2410	2
ASRC 1503	.2625	2
ASRC 1703	.2060	2
ASRC 1708	.1910	2
ASRC 1712	.1885	2
ASRC 1713	.1750	2
ASRC 3105 and 3106	.2410	2
ASRC 3110	.2600	2
B-123	.1820	2
Baytown B-129	.1960	2
Baytown B-134	.1900	2
B-142	.1515	2
Baytown B-172	.1825	2
Baytown 1600	.1930	2
Baytown 1601	.1930	2
Baytown 1602	.1930	2
Baytown 1606	.1820	2
Baytown 1608	.1845	2
Baytown 1609	.2080	2
Baytown 1801	.1760	2
Baytown 1803A	.1740	2
Baytown 1805A	.1550	2
Baytown 1808	.1480	2
Baytown 1809	.1545	2
Baytown 1811	.1569	2
Baytown 1813	.1640	2
Baytown 1815	.1496	2
Baytown 1816	.1580	2
Baytown 8600	.2410	2
Baytown 8676	.1876	2
Baytown 8679	.2022	2
Baytown 8681	.1835	2
Baytown 8682	.1890	2
Baytown 8700	.1885	2
Baytown 8775	.1545	2
Baytown 8776	.1679	2
Baytown 8781	.1655	2
Baytown 8782	.1583	2
Baytown 8783	.1515	2
Baytown 8784	.1598	2
C-102 (Shell)	.2300	2
Carbomix 1606	.1820	2
Carbomix 1608	.1845	2
Carbomix 1609	.2080	2
Carbomix 1808	.1480	2
Carbomix 1809	.1545	2
Carbomix 1811	.1569	2
Carbomix 1813	.1640	2
Carbomix 1814	.1545	2
Carbomix 1815	.1496	2
Carbomix 1817	.1715	2
Carbomix 3761	.1576	2
Carbomix 3764	.1685	2
CB-102 (Shell)	.1850	2
Copo 1006	.2410	2
Copo 1500	.2410	2
Copo 1502	.2410	2
Copo 1505 NS	.2610	2
Copo 1507	.2410	2
Copo 1510	.2410	2
Copo 1712	.1885	2
Copo 1713	.1750	2
Copo 1714	.1725	2
Copo 1778	.1910	2
FR-S 146	.2410	2
FR-S 158	.3000	2
FR-S 173	.2060	2
FR-S 178	.1910	2
FR-S 181 and 182	.2410	2
FR-S 184	.1885	2
FR-S 1000	.2410	2
FR-S 1001	.1410	2
FR-S 1004 and 1006	.2410	2
FR-S 1007	.2410	2
FR-S 1009	.2475	2
FR-S 1010	.2600	2
FR-S 1012	.2425	2
FR-S 1013	.2410	2
FR-S 1014	.2810	2
FR-S 1500 and 1502	.2410	2
FR-S 1703	.2060	2
FR-S 1710 and 1712	.1885	2
Gentro 1500	.2410	2
Gentro 1712	.1885	2
Gentro-Jet 9152	.2080	2
Gentro-Jet 9153	.1820	2
Gentro-Jet 9154	.1845	2
Gentro-Jet 9250	.1580	2
Gentro-Jet 9251	.1640	2
Gentro-Jet 9252	.1670	2
Gentro-Jet 9275	.1500	2
Naugapol 1015	.3500	2
Naugapol 1016	.2650	2
Naugapol 1018	.2700	2
Naugapol 1019	.2650	2
Naugapol 1022	.3050	2
Naugapol 1023	.3300	2
Naugapol 1503	.2625	1
Naugapol 1504	.3500	2
Naugapol 6003	.2700	2
Naugapol 6100	.3200	2
OB-102 (Shell)	.1825	2
OB-104 (Shell)	.1475	2
OB-106 (Shell)	.1510	2
OB-110 (Shell)	.1410	2
OB-111 (Shell)	.1540	2
OB-113C (Shell)	.1750	2
OB-114C (Shell)	.1420	2
OB-116 (Shell)	.1810	2
Philprene 1000	.2410	1
Philprene 1006	.2410	1
Philprene 1009	.2475	1
Philprene 1018	.2700	1
Philprene 1019	.2650	1
Philprene 1500 and 1502	.2410	2
Philprene 1503	.2625	1
Philprene 1601	.1930	1
Philprene 1603	.1960	1
Philprene 1605	.1900	1
Philprene 1606	.1820	2
Philprene 1608	.1845	1
Philprene 1609	.2080	1
Philprene 1703	.2060	1
Philprene 1708	.1910	1
Philprene 1712	.1885	1
Philprene 1803	.1740	1
Philprene 1805	.1550	1
Philprene 1808	.1480	1
Phoflex 1006	.2410	2
Phoflex 1500C	.2410	2
Phoflex 1502	.2410	2
Phoflex 1507	.2410	2
Phoflex 1508	.2410	2
Phoflex 1510	.2410	2
Phoflex 1712C	.1885	2
Phoflex 1713	.1750	2
Phoflex 1714C	.1725	2
Phoflex 1773	.2060	2
Phoflex 1778	.1910	2
Polysar Kryflex 200	.2510	1
Polysar Kryflex 202	.2535	1
Polysar Kryflex 252	.2700	1
Polysar Krylene, NS and 602	.2410	1
Polysar Krynol 651 and 653	.1885	1
Polysar Krynol 652 and 654	.1910	1
Polysar Krynol 655	.1885	1
Polysar S and S-630	.2410	1
Polysar SS-250	.2875	2
Polysar S-X370	.2475	1
Polysar S-X371	.2550	1
S-1000	.2410	2
S-1002	.2435	2
S-1006	.2410	2
S-1009	.2475	2
S-1011	.2475	2
S-1013	.2410	2
S-1500	.2410	2
S-1502	.2410	2
S-1509	.2410	2
S-1703	.2060	2
S-1707	.1910	2
S-1709	.1885	2
S-1710	.1885	2
S-1712	.1885	2
S-1778	.1910	2
S-7501	.2410	2
S-7652	.1960	2
S-7702	.1750	2
SP-102	.3000	2
SP-103	.3000	2
Synpol 1000 and 1001	.2410	2
Synpol 1002	.2435	2
Synpol 1006	.2410	2
Synpol 1007	.2410	2
Synpol 1009	.2475	2
Synpol 1012	.2425	2
Synpol 1013	.2410	2
Synpol 1061 and 1500	.2410	2
Synpol 1502	.2410	2
Synpol 1551	.2410	2
Synpol 1712	.2060	2
Synpol 1707 and 1708	.1910	2
Synpol 1712	.1885	2
Synpol 8103	.2401	2
Synpol 8151	.1820	2
Synpol 8152	.1860	2
Synpol 8200	.1910	2
Synpol 8201	.1750	2
Synpol 8202	.1725	2
Synpol 8208	.1750	2
Synpol 8255	.1480	2
Synpol 8253	.1584	1
Synpol 8255	.1545	1
Synpol 8266	.1598	1
Synpol 8267	.1640	1

Butyl Rubbers

Enjay Butyl 035 and 150	.2300	1
Enjay Butyl 165 NS	.2400	1
Enjay Butyl 215 and 217	.2300	2
Enjay Butyl 218	.2300	2
Enjay Butyl 268 NS	.2400	2
Enjay Butyl 325	.2300	2
Enjay Butyl 365 NS	.2400	2
Enjay Butyl 10-65 and 10-66	.3000	2
Enjay Butyl 10-67	.3000	2
Polysar Butyl 100 and 200	.2300	4
Polysar Butyl 101	.2775	4
Polysar Butyl 300 and 301	.2300	4
Polysar Butyl 400	.2300	4
Polysar Butyl 402, 450	.2400	4
Polysar Butyl 600	.2750	4

SYNTHETIC RUBBER POLYMERS

Chlorosulfonated Polyethylene

Hypalon 20	.4700 [2]
Hypalon 30	.6000 [2]
Hypalon 40	.5000 [2]

Fluoroelastomers

Fluorel	$10.25 [4]
Kel-F 3700 and 5500	$16.00 [2]
Viton A and A-HV	$10.00 [2]
Viton B	$10.00 [2]

Isoprene Rubber

Shell 300 and 305	.2500 [2]
Shell 307	.2600 [2]
Shell 500	.2150 [2]

Neoprene

	(prices l.c.l.)
Neoprene Types AC and CG	.5500 [3]
Neoprene Type AD	.5500 [3]
Neoprene Type FB	.6500 [3]
Neoprene Type GN	.4100 [3]
Neoprene Type GN-A	.4100 [3]
Neoprene Type GRT	.4200 [3]
Neoprene Type KNR	.7500 [3]
Neoprene Type S	.4200 [3]
Neoprene Type W	.3900 [3]
Neoprene Type WB	.4100 [3]
Neoprene Type WHV	.3700 [2]
Neoprene Type WRT	.4500 [3]
Neoprene Type WX	.4100 [3]

Polysulfide Rubbers

	(prices l.c.l.)
Thiokol Type A	.6000 [2]
Thiokol Type FA	.7400 [2]
Thiokol Type ST	1.2500 [3]

Silicone Rubbers*

	(prices l.c.l.)
GE (compounded)	2.17 [2]
GE Silicone Gum (not compounded)	3.68 [2]
Silastic (compounded)	2.50 [2]
Silastic (gums)	4.00 [3]
Union Carbide (gums)	4.00 [3]
Union Carbide (compounds)	2.50 [3]

Latex

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [2]
Butaprene N-400 and N-401	.5400 [1]
Chemigum 200	.4800 [3]
Chemigum 235	.5300 [3]
Chemigum 236	.5300 [3]
Chemigum 245	.4500 [3]
Chemigum 246	.4500 [3]
Chemigum 247	.4500 [3]
Chemigum 248	.4500 [3]
Hycar 1512	.4500 [2]
Hycar 1551	.5300 [2]
Hycar 1552	.4500 [3]
Hycar 1561	.5300 [2]
Hycar 1562	.4500 [3]
Hycar 1571	.5300 [3]
Hycar 1572	.4500 [3]
Hycar 1577	.4500 [3]
Nitrex 2612	.4500 [1]
Nitrex 2616	.5300 [1]
Nitrex 2620	.4500 [1]
Nitrex 2625	.4500 [1]
Polysar Latex XPRD-845	.4900 [2]
Tylac 640 and 650	.4500 [1]
Tylac 750	.4900 [1]
Tylac 850	.5300 [1]
Tylac 1640 and 1650	.5400 [1]

Butadiene-Styrene Types

CL-101 (Shell)	.2800 [2]
Copo 2000	.2750 [2]
Copo 2101	.3000 [2]
Copo 2102	.3200 [2]
Copo 2105	.3200 [2]
Copo 2108	.3000 [2]
Copo 2109	.2775 [2]
Copo 2110	.3200 [2]
Copo 3852	.3000 [3]
FR-S 110	.3000 [2]
FR-S 150	.3000 [2]
FR-S 151	.2900 [2]
FR-S 174	.2950 [2]
FR-S 176	.2775 [2]
FR-S 2000	.2775 [2]
FR-S 2001	.2775 [2]
FR-S 2002	.3000 [2]
FR-S 2003	.3050 [2]
FR-S 2004	.3050 [2]
FR-S 2006	.2900 [2]
FR-S 2105	.3200 [2]
Naugatex 2000 and 2001	.2750 [1]
Naugatex 2002	.3000 [1]
Naugatex 2006	.2900 [1]
Naugatex 2105 and 2107	.3200 [1]
Naugatex 2108	.3000 [1]
Naugatex 2113	.2900 [1]
Naugatex J-8174-F	.3200 [1]
Naugatex J-8855	.3000 [1]
Naugatex J-9049	.2750 [1]
Naugatex J-9064	.3050 [1]
Pliolite 2000 and 2001	.2775 [2]
Pliolite 2076	.2900 [2]
Pliolite 2104	.4200 [2]
Pliolite 2105 and 2107	.3200 [2]
Pliolite 2108	.3000 [2]
Polysar Latex IV	.2775 [3]
Polysar Latex 722	.3200 [3]
Polysar Latex 723	.3200 [3]
Polysar Latex 741	.3000 [3]
Polysar Latex 781	.6750 [3]
S-2000 and S-2006	.2600 [2]
S-2101	.2600 [2]
S-2105	.2800 [2]
S-2108	.2900 [2]
Tylac 400	.3000 [3]
Tylac 405, 430, 450-A	.2750 [1]
Tylac 410 and 420	.2900 [1]
Tylac 450-A	.2750 [1]
Tylac 3040 and 3340	.3200 [1]

Butyl

Butyl Latex 80-21	.3500 [2]

Neoprene

Neoprene Latex 60	.4000 [3]
Neoprene Latex 571	.3700 [3]
Neoprene Latex 572	.3900 [3]
Neoprene Latex 601-A	.4000 [3]
Neoprene Latex 673	.5000 [3]
Neoprene Latex 735	.3800 [3]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3500 [2]
Neoprene Latex 950	.4700 [3]

Polysulfide Rubbers

Thiokol Type MX	.8000 [3]
Thiokol Type WD-2	1.2500 [3]
Thiokol Type WD-6	.8000 [3]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. (4) Freight equalized. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

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Market Editor RUBBER AGE

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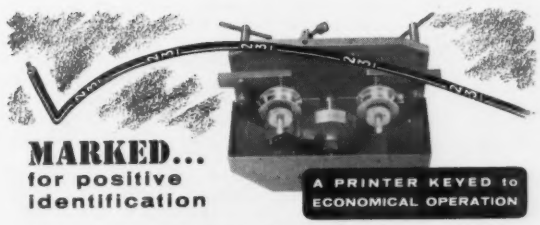

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MARKETS

(continued)

Reclaimed Rubber

The Rubber Manufacturers Association reports that in the first seven months of the current year a total of 152,629 long tons of reclaimed rubber were produced in the United States. This compares with the 181,376 long tons produced in the first seven months of the previous year.

In the first seven months of the current year, 142,998 long tons of reclaim were consumed, contrasted with the 169,625 long tons consumed in the first seven months of 1960. As of July 31, 1961, there were 32,968 long tons of reclaim in stocks on hand, while on July 31, 1960, there were 33,624 long tons in stocks.

The trade reports some slight pick-up in demand what with the end of vacation schedules and the commencement of production of 1962 model automobiles. It may be that the last five months of the year will show a pattern similar to 1960.

(Prices for All Areas Except West Coast)
(Average price, carload quantities, minimum freight allowed)

	per lb.
First Line Whole Tire	.11½
First Line Whole Tire Stainless	.12¼
Second Line Whole Tire	.11
Third Line Whole Tire	.10¾
Fourth Line Whole Tire	.10¼
Black Carcass	.15¾
Peelings	.11½
Butyl Tube	.16
Natural Rubber Black Tube	.17
Natural Rubber Red Tube	.21
Mechanical, Light Color, Low Gravity	.26
Mechanical, Light Color, Medium Gravity	.20

Scrap Rubber

Sales in scrap rubber continued at a fair pace during the past period and movements involved fair tonnages. With most plants back at normal production schedules and scrap rubber demand fairly good, consumption is reportedly running steady with last year's levels. Prices during the period were generally unchanged.

The Rubber Manufacturers Association reports that in the first seven months of this year a total of 142,122 long tons of scrap rubber were consumed. This averages to about 20,000 long tons a month for a yearly total of 240,000 long tons. Current prices follow:

(Prices Delivered Akron)

Mixed tires	ton	14.00
Light colored carcass	lb.	.06
No. 1 peelings	ton	38.00
No. 2 peelings	ton	27.60
No. 3 peelings	ton	20.00
Buffings	ton	14.00
Truck and Bus S.A.G.	ton	20.00
Passenger S.A.G.	ton	20.00
Natural Rubber Red Tubes	lb.	.08
Natural Rubber Black Tubes	lb.	.07
Butyl Rubber Tubes	lb.	.07¼

Tire Fabrics

Nylon's share of truck tire sales reached an all-time high in the first quarter of 1961, according to figures released by the Chemstrand Corp. These figures show that more than 60 per cent of all replacement truck and bus tires shipped during the first quarter of 1961 were made of nylon cord, the highest percentage recorded to date, Chemstrand says.

In original equipment tires, another record high mark was set when more than 36 per cent of all truck and bus tires shipped were made of nylon cord. The increased use of nylon in original equipment truck tires indicated a greater trend toward specification of nylon cord tires by fleet operators when they purchase new vehicles.

In replacement passenger tires, 49.86 per cent of all tires shipped in 1960 were of nylon, while in the first quarter of 1961 that figure had gone up to 51.87. In replacement truck tires, 55.60 per cent of those shipped in 1960 were of nylon, while in the first quarter of 1961 that figure rose to 60.91. In original equipment truck tires, 30.56 of those shipped in 1960 were of nylon.

Nylon Cord Fabric

Total nylon cord fabric consumed in the manufacture of tires has also increased, Chemstrand noted. By the first quarter of 1961 there was an increase of 3.12 million pounds of nylon cord fabric utilized in the manufacture of tires over the fourth quarter of 1960. This amounted to a 12.0 per cent increase. Total nylon cord fabric consumed was 25.89 million pounds in the last period of 1960 compared with 29.01 million pounds in the first period of 1961.

In April of this year, Chemstrand called attention to the fact that nylon tire cord consumption during 1960 increased 12 per cent over the previous year, while rayon tire cord consumption declined 19.3 per cent.

Manufacturers' shipments of nylon cord passenger car tires in 1960 rose to an all-time high of more than 34 million, an increase of almost 9 million tires, representing a 34.96 per cent rise over 1959, it was pointed out.

(Prices f.o.b. Shipping Points)

Rayon Tire Cord

1100	lb.	.57
1650	lb.	.51
2200	lb.	.50

Nylon Tire Cord

840	lb.	.92
1680	lb.	.92

Rayon Graded Fabric

1100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.71
9.25 oz. (per square yard)	lb.	.72
11.65 oz. (per square yard)	lb.	.66
14.4 oz. (per square yard)	lb.	.75

Liquid Latex

Natural: The natural latex market continues its lethargic pace. During the first seven months of this year, the Rubber Manufacturers Association reports, a total of 25,188 long tons of natural latex were imported into the United States, compared with the 33,411 long tons of natural latex imported into the United States in the first seven months of the preceding year.

As for consumption, in the first seven months of this year 23,948 long tons of natural latex were consumed in the United States against the 30,007 long tons consumed in the first seven months of 1960. Consumption of natural latex for the year should approximate 40,000 long tons.

Natural rubber latex is currently selling at a 37 to 38c per pound level at East Coast ports in car load lots. This is slightly higher than the prices which were in evidence at this time last month. Prices, however, are expected to play only a minor role in the statistical picture for the balance of the year.

Synthetic: The synthetic rubber latex segment continues to do well within the framework of the generally lower economy. Statistically, synthetic latex has suffered only to the extent that the rest of the rubber industry has suffered. Prices remain stable.

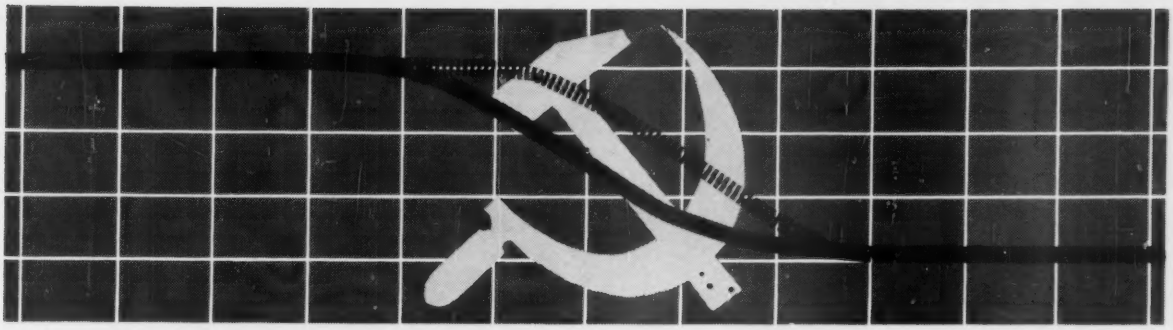
Cotton

The price of middling uplands on the New York Cotton Exchange moved in the extremely narrow range of 20 points since our last report (August 1), high for the period being 35.20c reached on August 29, 30 and 31, and low being 35.00 reached on August 1 and 2. The average price of middling uplands for the month of August was 35.11c based on 23 trading days. This compares with an average of 34.82c in the previous month.

The Census Bureau reports ginnings to August 16 totaled 456,819 running bales compared with 381,788 bales to August 16 last year. While the ginnings were larger than last year, actually the crop is late, and the heavy ginnings are largely accounted for by heavy ginnings in South Texas where the crop was early. The Census Bureau also notes that consumption to July 29, 1961 totaled 8,268,368 bales versus 9,025,305 bales last year.

There has been a very strong cotton goods market. Goods have moved for both spot and some 4th and 1st quarters but not in large volume. There was no progress made in Tokyo, where United States and Japan are negotiating 1962 quotas on Japanese exports of cotton goods and apparel to United States.

Spot prices are approaching the levels of the loan in the various cotton states. There is one point—Fresno—where the spot price is 51 points above the loan. There is not much cotton moving into commercial channels, and most of the cotton is said to be headed for the government loan stocks.



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The Soviet Union has achieved rapid progress in all branches of knowledge since World War II. Although this has been obvious for many years it has been extremely difficult because of the language barrier for those in the Western countries to follow the technical progress being made. This is no longer true where rubber chemistry and technology is involved because cover-to-cover translations of "Kauchuk i Rezina," the most important monthly Russian rubber journal, are available in English under the title of SOVIET RUBBER TECHNOLOGY. The translation work is made financially possible by a grant from the British Department of Scientific and Industrial Research and is carried out by the Rubber and Plastics Research Association of Great Britain.

Let the official Soviet publication keep you informed of Russian technical developments behind the Iron Curtain. Remember that the Russians have no reason to hide anything from their readers for patent or other factors. There are no "company secrets" in the Soviet Union and rarely is comparable information made so readily available in Western journals. Now in its third year, the English translation of "Kauchuk i Rezina" affords you an excellent means of charting Russian activities in all phases of rubber manufacturing—efficient use of raw materials, automation of manufacturing processes, design of tires and industrial rubber goods, and many others. And how else could you secure translations of some 600 pages of Russian for only $50.00 per year!

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STATISTICS of the industry

PERTINENT INDUSTRY DATA

Natural Rubber in the United States

(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1942	282,653	376,791	10,856	422,714
1943	55,329	317,634	20,815	139,594
1944	107,834	144,113	9,665	93,650
1945	135,672	105,429	6,743	118,715
1946	400,687	277,597	4,338	237,467
1947	688,354	562,661	4,101	129,038
1948	735,227	627,332	6,673	141,541
1949	660,792	574,522	6,253	106,619
1950	802,249	720,268	8,644	89,215
1951	733,048	454,015	2,603	76,569
1952	805,997	453,846	3,024	95,260
1953	647,150	553,473	8,376	112,316
1954	596,848	596,285	7,443	104,543
1955	635,174	634,800	10,611	110,105
1956	580,510	563,095	11,300	115,949
1957	499,121	539,761	10,146	100,901
1958	474,409	484,492	20,085	76,491
1959	526,048	555,044	18,750	79,405
1960	410,640	479,598	12,409	77,525
1960:				
Jan.	34,795	46,354	1,373	76,156
Feb.	40,949	46,022	1,448	75,320
Mar.	38,580	47,205	1,522	81,599
Apr.	36,344	42,032	803	83,451
May	32,018	41,263	840	82,693
June	31,639	42,576	509	76,605
July	28,555	35,229	1,488	76,389
Aug.	39,596	37,258	912	82,385
Sept.	31,862	36,770	754	82,227
Oct.	24,594	26,312	1,150	76,116
Nov.	30,411	40,965	1,177	71,608
Dec.	39,084	31,891	593	77,525
1961:				
Jan.	33,750	35,149	650	80,238
Feb.	24,682	31,871	437	76,412
Mar.	29,946	34,908	360	72,360
Apr.	26,123	33,207	442	69,019
May	3,395	35,284	—	63,397

Source: U. S. Department of Commerce.

U. S. Imports of Natural Rubber

Year	Dry — Long Tons	Dry — Declared Value	Latex — Long Tons	Latex — Declared Value	Total Imports
1949	630,808	225,343,624	29,743	14,968,650	660,551
1950	747,109	416,222,598	54,401	41,764,486	801,510
1951	677,874	727,343,348	54,963	80,178,309	732,837
1952	756,987	578,179,519	48,228	40,563,116	805,215
1953	571,635	284,909,223	75,511	46,353,333	647,146
1954	522,364	219,098,143	74,483	42,755,029	596,847
1955	542,507	360,435,303	92,825	80,163,114	635,332
1956	499,479	334,990,045	71,709	61,795,844	564,321
1957	475,958	291,337,628	78,567	58,249,788	554,174
1958	406,059	153,127,066	67,593	45,047,040	473,652
1959	498,749	304,594,223	79,205	60,939,662	577,954
1960	357,071	278,318,969	49,653	43,964,341	406,724
1960:					
Feb.	35,137	27,281,957	5,812	5,411,873	40,949
Mar.	33,453	26,696,437	5,128	4,659,021	38,581
Apr.	31,408	25,659,607	4,940	4,690,140	36,348
May	26,637	21,962,099	5,830	4,853,091	32,467
June	28,304	23,661,317	3,335	3,152,266	31,639
July	25,072	21,637,414	3,483	3,335,694	28,555
Aug.	35,423	28,919,412	4,174	3,825,191	39,597
Sept.	24,848	23,321,841	2,541	2,259,381	27,389
Oct.	24,866	17,985,313	2,042	1,615,488	26,908
Nov.	26,955	17,654,645	3,456	2,786,602	30,411
Dec.	35,513	21,371,539	3,572	2,685,181	39,085
1961:					
Jan.	28,990	16,356,186	4,761	3,539,388	33,751
Feb.	22,047	11,670,555	4,719	3,677,336	26,766
Mar.	24,881	13,284,536	3,856	2,547,116	28,737
Apr.	21,554	11,215,884	3,029	2,006,933	24,583

Source: Bureau of the Census, U. S. Department of Commerce.

World Production of Natural Rubber

(Including Latex)

(Long Tons)

Year	Malaya	Indonesia	Ceylon	Viet Nam & Cambodia	Latin America*	Rest of World*	Total*
1954	584,435	738,670	93,935	78,024	26,833	280,112	1,802,500
1955	639,128	733,786	93,830	80,172	6,000	344,584	1,897,500
1956	568,550	686,667	95,389	89,072	22,457	336,015	1,857,000
1957	638,706	684,515	98,164	58,440	28,351	381,824	1,890,000
1958	663,644	614,561	100,196	103,613	26,268	446,718	1,955,000
1959	698,249	721,359	91,696	108,398	23,962	421,336	2,065,000
1960:							
July	63,146	46,018	6,689	10,802	600	27,745	155,000
Aug.	62,164	34,117	8,394	10,276	600	36,949	152,500
Sept.	61,786	53,050	6,502	10,055	600	40,507	172,500
Oct.	63,109	54,153	9,121	10,587	600	34,930	172,500
Nov.	56,883	35,676	6,880	13,981	600	35,980	150,000
Dec.	66,902	71,304	13,153	14,853	600	38,188	205,000
1961:							
Jan.	67,475	34,891	10,251	12,707	2,895	29,281	157,500
Feb.	56,733	45,598	5,384	3,102	3,191	33,492	147,500
Mar.	51,480	62,913	8,494	1,900	3,491	39,222	167,500

Source: International Rubber Study Group. * Estimated.

World Consumption of Natural and Synthetic Rubber

(Including Latex)

(Long Tons)

Year	United States	United Kingdom	Canada	Europe*	Rest of World*	Total*
1953	1,338,309	211,453	73,394	521,000	343,606	2,500,000
1954	1,233,012	247,612	71,656	544,250	408,094	2,505,000
1955	1,529,699	266,804	84,528	630,000	464,250	2,980,000
1956	1,436,482	232,345	91,458	775,500	489,215	3,025,000
1957	1,464,640	239,021	83,379	777,250	565,710	3,135,000
1958	1,364,404	238,439	83,904	905,000	638,353	3,230,000
1959	1,626,370	259,655	101,484	985,250	689,741	3,662,500
1960:						
July	114,642	18,991	6,393	83,000	66,974	290,000
Aug.	125,836	17,266	6,253	78,750	66,895	295,000
Sept.	124,100	28,272	7,940	95,750	61,438	317,500
Oct.	125,817	24,002	7,238	100,500	57,443	315,000
Nov.	122,144	23,083	8,190	97,500	61,583	312,500
Dec.	111,967	23,224	6,925	94,750	55,634	292,500
1961:						
Jan.	121,350	23,600	6,872	102,250	68,428	322,500
Feb.	109,604	21,200	6,689	100,250	57,257	295,000
Mar.	120,916	24,200	7,438	109,000	62,946	322,500

Source: International Rubber Study Group. * Estimated.

Rim Production

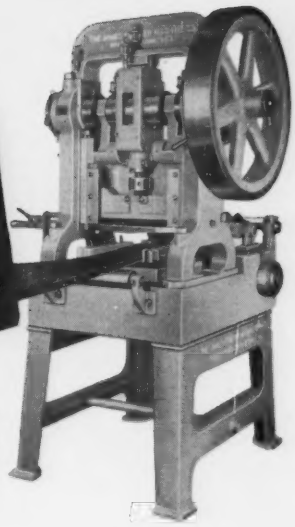
	1956	1957	1958	1959	1960
Passenger Car	27,109,610	27,301,567	20,665,688	25,412,177	29,288,767
Truck & Bus	6,315,428	5,468,223	3,887,910	5,019,261	4,874,401
Agricultural	1,416,938	1,368,127	1,218,240	1,386,866	827,945
Earth Mover	88,812	67,289	61,883	111,077	93,971
Total	34,930,788	34,205,206	25,833,721	31,929,381	35,091,084

	1961 — Feb.	Mar.	Apr.	May	June	July
Passenger Car	1,348,679	1,675,883	1,519,253	2,256,602	2,155,710	1,303,277
Truck and Bus	323,271	372,768	231,855	311,624	363,898	333,252
Agriculture	95,898	98,789	95,820	104,694	81,063	23,712
Earth Mover	13,692	12,589	5,505	8,578	10,998	5,786
Total	1,781,540	2,160,029	1,852,433	2,681,498	2,611,669	1,666,027

Source: The Tire & Rim Association, Inc.

Coulter...

Cutting Rubber Economically ... Since 1896



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Precision cutting for multiple heels, half and full soles with stock grain.

PRECISION RUBBER CUTTING MACHINES CUT WITH OR ACROSS STOCK GRAIN

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- Mechanical rubber goods

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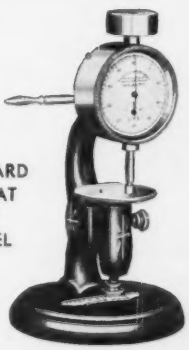

STANDARD THROAT 1¾" MODEL

THROAT DEPTHS
1¾" to 26"
FOOT TENSIONS
supplied by Internal Spring or Direct Weights
FOOT DIAMETERS
⅛" to 1¼"
ROLLS
Table and Roll or two Rolls
RANGE
½" or 1", also 1 CM Metric

26" DEEP THROAT MODEL

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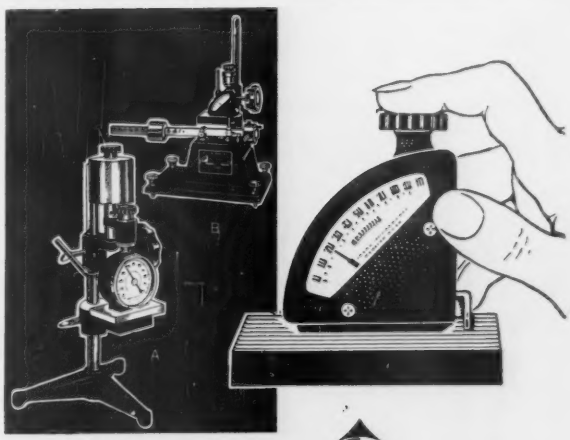


THE ORIGINAL Shore

DUROMETER

Since 1915 the international standard for testing the hardness of rubber and rubber-like materials including plastics, both elastomeric and semi-rigid.

FEATURES

- Available in both quadrant style and round style. Conform to ASTM D676, D1484 and D1706.
- May be used on Operating Stand "A" with or without DEAD WEIGHT to insure reproducible readings.
- The Durocalibrator "B" is for field use in calibrating and verifying the accuracy of Shore Durometers.

Shore **INSTRUMENT & MFG. CO., INC.**
90-35 VAN WYCK EXPRESSWAY
JAMAICA 35, NEW YORK

Synthetic Rubber in the United States

(All Quantities in Long Tons)

New Supply

Year	GR-S	Neoprene	Butyl	N-Type	Total
1957	**913,321**	**110,721**	**67,418**	**33,618**	**1,125,078**
1958	872,565	97,806	54,113	32,431	1,056,915
1959	1,134,379	124,815	82,704	43,588	1,385,486
1960	1,172,006	134,442	100,684	38,405	1,445,539
1960:					
May	102,850	11,401	10,115	3,113	127,479
June	99,175	11,614	9,723	2,891	123,403
July	95,892	10,210	8,484	2,519	117,105
Aug.	99,213	10,120	9,999	3,247	122,579
Sept.	90,607	10,078	9,406	3,211	113,302
Oct.	88,451	11,219	8,906	3,226	111,802
Nov.	87,938	11,261	8,605	3,327	111,131
Dec.	86,628	11,291	4,232	3,194	105,345
1961:					
Jan.	85,025	11,896	6,316	3,272	106,509
Feb.	79,892	10,344	7,875	3,134	101,245
Mar.	90,418	10,073	9,783	3,289	113,563
Apr.	88,346	8,776	8,686	3,560	109,368
May	89,662	8,871	7,391	3,578	109,502

Consumption

1958	730,196	69,694	53,432	26,590	880,912
1959	886,275	84,955	65,454	34,638	1,071,322
1960	900,495	81,055	62,345	30,875	1,074,770
1960:					
May	77,423	6,471	5,602	2,497	91,993
June	80,951	7,129	5,150	2,619	95,849
July	67,853	4,936	4,597	2,027	79,413
Aug.	73,761	7,200	4,880	2,737	88,578
Sept.	72,593	7,096	4,901	2,740	87,330
Oct.	74,606	6,920	4,552	2,706	88,784
Nov.	72,702	6,372	4,455	2,650	86,179
Dec.	67,549	5,983	4,229	2,315	80,076
1961:					
Jan.	71,653	6,345	5,143	2,591	85,732
Feb.	64,710	5,802	4,544	2,121	77,177
Mar.	71,110	6,592	5,005	2,559	85,266
Apr.	68,287	6,101	4,653	2,743	81,784
May	74,188	6,563	5,142	3,067	88,960

Exports

1958	142,069	31,337	13,793	6,718	193,917
1959	211,300	39,551	21,700	8,256	280,843
1960	257,027	47,580	29,649	7,699	341,955
1960:					
Apr.	28,765	5,268	2,006	676	36,715
May	23,337	4,213	1,936	1,320	30,806
June	23,130	3,699	2,062	464	29,355
July	19,721	4,446	3,792	616	28,575
Aug.	22,753	3,519	3,494	501	30,267
Sept.	16,836	3,340	3,500	389	24,065
Oct.	15,439	3,913	2,922	629	22,903
Nov.	17,792	2,760	1,928	546	23,026
Dec.	17,415	2,775	2,282	759	23,231
1961:					
Jan.	18,180	5,047	2,273	545	26,045
Feb.	18,949	4,010	2,423	785	26,167
Mar.	19,415	4,471	2,933	649	27,468
Apr.	18,795	2,548	1,075	708	23,126

Stocks

1957	**140,199**	**18,843**	**31,489**	**7,454**	**197,985**
1958	143,533	15,688	18,770	7,292	185,283
1959	**174,606**	14,164	13,188	**8,888**	**210,846**
1960	192,199	19,734	23,485	6,998	242,416
1960:					
May	188,808	14,243	16,014	8,267	227,332
June	**183,996**	15,411	18,912	7,713	226,032
July	**192,552**	16,954	18,689	7,498	235,693
Aug.	**198,695**	16,072	20,877	7,096	242,740
Sept.	**198,067**	16,590	21,271	7,031	242,959
Oct.	**192,090**	16,405	23,205	6,891	238,591
Nov.	**189,466**	18,056	25,594	6,922	240,038
Dec.	192,199	19,734	23,485	6,998	242,416
1961:					
Jan.	**186,626**	19,865	23,035	6,721	236,247
Feb.	181,556	21,707	22,783	6,990	233,036
Mar.	180,355	21,941	26,212	7,119	235,627
Apr.	183,353	21,314	29,504	7,749	241,920
May	178,761	20,510	31,627	7,811	238,709

Source: U. S. Department of Commerce.

Natural and Synthetic Rubber Latex in the United States

(All Quantities in Long Tons)

New Supply

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Grand Total
1955	92,754	69,364	10,432	10,798	90,594	183,348
1956	72,013	69,720	10,642	10,650	91,012	163,025
1957	**72,252**	**74,535**	10,403	**11,420**	**96,358**	**168,610**
1958	**67,591**	**65,669**	10,679	**11,560**	**87,908**	**155,499**
1959	**72,502**	**93,303**	13,127	**14,034**	**120,464**	**192,966**
1960	49,196	101,220	12,746	13,418	127,384	176,580
1960:						
Feb.	5,812	9,862	1,085	1,098	12,045	17,857
Mar.	5,127	9,351	1,004	1,217	11,572	16,699
Apr.	4,935	9,408	1,137	917	11,462	16,397
May	5,380	8,162	1,250	1,009	10,421	15,801
June	3,335	7,541	965	973	9,479	12,814
July	3,483	6,481	953	983	8,417	11,900
Aug.	4,174	8,096	978	1,291	10,365	14,539
Sept.	2,541	9,397	1,119	1,299	11,815	14,356
Oct.	2,042	9,063	1,272	1,176	11,511	13,553
Nov.	3,456	7,205	1,169	1,328	9,702	13,158
Dec.	3,572	6,934	660	996	8,590	12,162
1961:						
Jan.	4,761	7,821	853	1,174	9,848	14,609
Feb.	3,506	6,286	817	966	8,669	11,575
Mar.	3,855	8,500	1,205	763	10,468	14,323
Apr.	3,029	7,703	1,167	1,008	9,878	12,907
May	....	8,614	729	1,095	10,438	10,438

Consumption[1]

1956	74,082	62,762	8,708	8,021	79,491	153,573
1957	**75,009**	**68,305**	**9,039**	**8,630**	**85,974**	**160,983**
1958	**70,183**	**60,283**	**9,555**	**10,549**	**80,387**	**150,570**
1959	71,745	80,646	11,394	13,258	105,298	177,043
1960	50,898	87,457	11,221	12,079	110,757	161,655
1960:						
Feb.	5,463	7,838	969	1,000	9,807	15,270
Mar.	4,847	8,104	1,076	927	10,107	14,954
Apr.	4,199	7,154	913	976	9,043	13,242
May	3,655	6,821	868	978	8,667	12,322
June	3,975	7,147	1,033	981	9,161	13,136
July	2,912	5,433	729	780	6,942	9,854
Aug.	3,897	7,857	1,057	1,078	9,992	13,889
Sept.	4,250	7,458	942	1,122	9,522	13,772
Oct.	4,283	7,371	971	1,118	9,460	13,743
Nov.	4,338	7,171	914	1,104	9,189	13,527
Dec.	3,588	6,756	750	898	8,404	11,992
1961:						
Jan.	3,525	6,667	779	1,005	8,451	11,976
Feb.	3,298	6,303	727	713	7,743	11,041
Mar.	3,575	6,866	936	904	8,706	12,281
Apr.	3,413	6,529	864	1,130	8,523	11,936
May	3,473	6,971	911	1,113	8,995	12,468

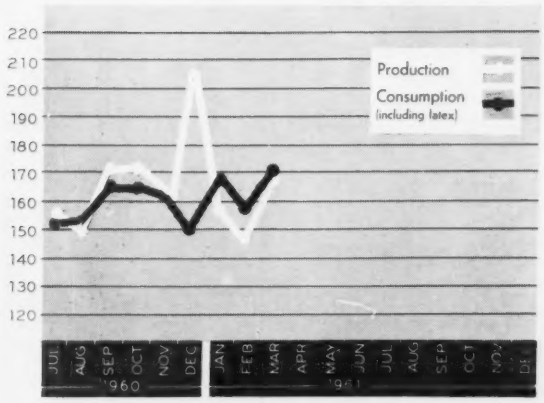
Stocks at End of Period

1956	12,064	7,451	1,384	1,558	10,393	22,457
1957	**14,454**	**8,347**	**1,267**	**1,974**	**11,588**	**26,042**
1958	8,900	7,672	1,663	2,519	11,854	20,754
1959	**12,717**	**8,226**	**1,581**	**2,883**	**12,690**	**25,067**
1960	9,225	9,204	1,665	2,242	13,111	22,336
1960:						
Feb.	12,974	8,606	1,534	2,535	12,675	**25,649**
Mar.	13,964	8,055	1,518	2,492	12,065	**26,029**
Apr.	13,896	9,081	1,595	2,242	12,918	**26,814**
May	15,214	10,031	1,745	2,342	14,118	**29,332**
June	14,140	9,142	1,530	1,941	12,613	**26,753**
July	14,785	9,364	1,564	2,064	12,992	**27,777**
Aug.	13,690	8,641	1,333	1,967	11,941	**25,631**
Sept.	12,852	9,172	1,494	2,034	12,700	**25,552**
Oct.	10,634	10,000	1,626	1,999	13,625	**24,259**
Nov.	9,284	9,180	1,798	2,300	13,278	**22,562**
Dec.	9,225	9,204	1,665	2,242	13,111	22,336
1961:						
Jan.	9,866	9,395	1,582	2,128	13,105	22,971
Feb.	10,280	8,801	1,508	2,247	12,556	22,836
Mar.	10,318	9,254	1,927	2,124	13,305	23,623
Apr.	9,404	8,643	2,058	2,271	12,972	22,376
May	8,535	9,510	1,652	2,254	13,416	21,951

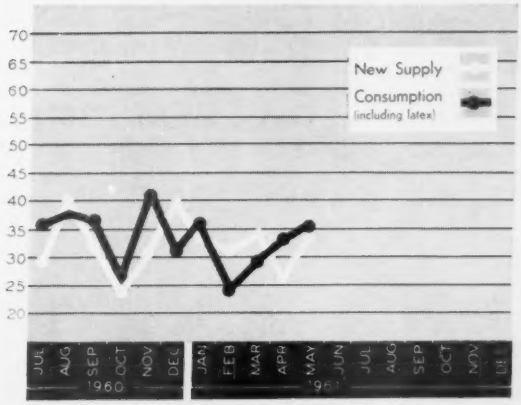
Source: U. S. Department of Commerce.
Note: (1) GR-S and Neoprene consumption estimated through 1950.

STATISTICS at a glance

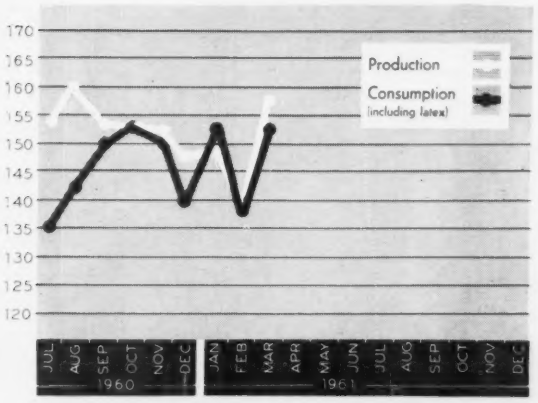
NATURAL RUBBER—WORLD
(thousands of long tons)



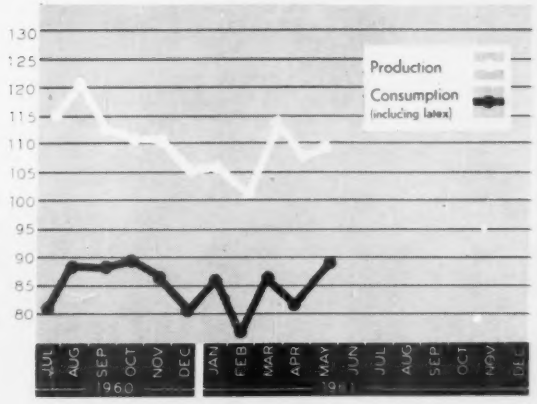
NATURAL RUBBER—UNITED STATES
(thousands of long tons)



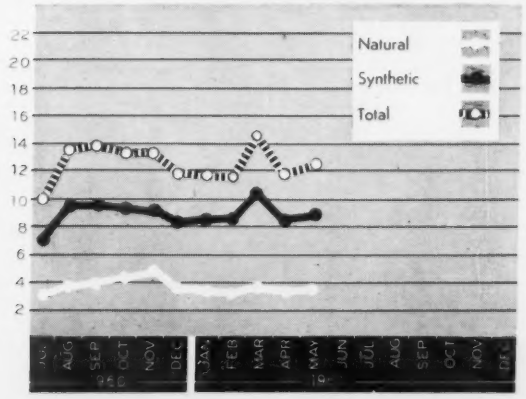
SYNTHETIC RUBBER—WORLD
(thousands of long tons)



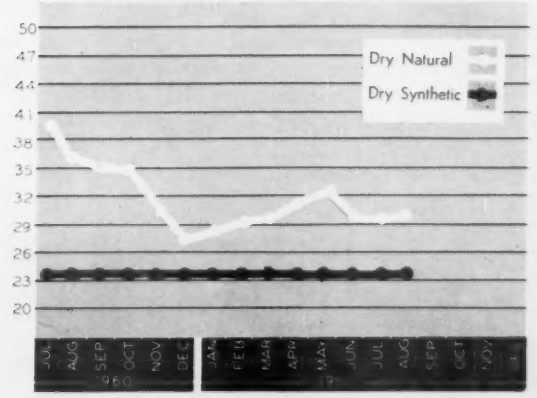
SYNTHETIC RUBBER—UNITED STATES
(thousands of long tons)



LATEX CONSUMPTION—UNITED STATES
(thousands of long tons)



PRICES—NATURAL AND SYNTHETIC
(cents per pound)



Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1954 (total)	**33,333**	**55,155**	**1,753**	**90,241**	**89,141**	**14,762**
Passenger Car.	**29,741**	**47,044**	**928**	**77,713**	**76,794**	**12,217**
Truck and Bus	**3,591**	**8,111**	**826**	**12,528**	**12,347**	**2,545**
1955 (total)	**47,374**	**59,246**	**1,879**	**108,499**	**112,178**	**18,778**
Passenger Car.	**42,574**	**50,189**	**966**	**93,730**	**97,223**	**15,963**
Truck and Bus	**4,800**	**9,057**	**912**	**14,769**	**14,955**	**2,815**
1956 (total)	**35,422**	**62,146**	**1,757**	**99,325**	**100,406**	**79,872**
Passenger Car.	**30,873**	**53,252**	**875**	**85,000**	**85,546**	**16,494**
Truck and Bus	**4,548**	**8,894**	**883**	**14,325**	**14,859**	**3,378**
1957 (total)	**36,765**	**65,150**	**1,733**	**103,649**	**106,940**	**250,536**
Passenger Car.	**32,725**	**56,603**	**889**	**90,217**	**93,542**	**210,146**
Truck and Bus	**4,053**	**8,546**	**846**	**13,432**	**13,398**	**40,384**
1958 (total)	**26,783**	**70,797**	**1,348**	**98,928**	**96,563**	**20,939**
Passenger Car.	**23,408**	**61,570**	**717**	**85,696**	**83,636**	**17,778**
Truck and Bus	**3,375**	**9,226**	**631**	**13,232**	**12,927**	**3,161**
1959 (total)	**34,163**	**76,812**	**1,430**	**112,405**	**117,875**	**26,933**
Passenger Car.	**29,746**	**66,797**	**786**	**97,329**	**102,637**	**23,578**
Truck and Bus	**4,417**	**10,015**	**644**	**15,076**	**15,238**	**3,355**
1960 (total)	40,205	77,785	1,722	119,712	119,844	27,540
Passenger Car.	36,320	68,535	943	105,799	105,361	23,583
Truck and Bus	3,885	9,250	777	13,912	14,482	3,957
1960:						
July (total)	2,735	7,228	150	10,113	9,788	26,108
Passenger Car.	2,456	6,377	82	8,915	8,680	22,097
Truck and Bus	279	851	68	1,197	1,108	4,011
Aug. (total)	1,578	7,213	151	8,941	9,147	26,298
Passenger Car.	1,359	6,389	76	7,824	8,061	22,326
Truck and Bus	219	823	75	1,117	1,085	3,972
Sept. (total)	2,950	6,560	120	9,630	9,184	25,893
Passenger Car.	2,676	5,749	59	8,484	8,158	22,037
Truck and Bus	273	811	61	1,146	1,026	3,856
Oct. (total)	3,589	6,304	121	10,014	9,530	25,499
Passenger Car.	3,342	5,366	53	8,760	8,461	21,816
Truck and Bus	247	938	62	1,254	1,069	3,683
Nov. (total)	3,425	4,772	105	8,303	9,044	26,290
Passenger Car.	3,171	4,123	55	7,348	7,979	22,493
Truck and Bus	255	649	51	955	1,066	3,797
Dec. (total)	3,087	4,464	112	7,663	8,804	27,541
Passenger Car.	2,844	3,912	55	6,812	7,809	23,583
Truck and Bus	243	552	56	851	995	3,957
1961:						
Jan. (total)	2,449	6,590	91	9,130	9,221	27,682
Passenger Car.	2,191	5,955	44	8,189	8,234	23,691
Truck and Bus	258	635	48	941	988	3,991
Feb. (total)	2,191	4,720	92	7,002	8,589	29,338
Passenger Car.	1,930	4,150	43	6,123	7,641	25,268
Truck and Bus	261	569	49	879	948	4,070
Mar. (total)	2,448	6,595	123	9,166	9,212	29,385
Passenger Car.	2,134	5,876	72	8,082	8,196	25,385
Truck and Bus	313	719	52	1,084	1,016	4,000
Apr. (total)	2,934	7,202	96	10,232	8,882	28,033
Passenger Car.	2,602	6,444	54	9,100	7,866	24,150
Truck and Bus	332	758	43	1,133	1,017	3,883
May (total)	3,377	7,716	99	11,192	9,604	26,503
Passenger Car.	3,031	6,944	57	10,032	8,501	22,669
Truck and Bus	346	772	42	1,160	1,103	3,843
June (total)	3,123	8,473	113	11,709	9,920	24,801
Passenger Car.	2,791	7,524	73	10,388	8,803	21,157
Truck and Bus	332	949	40	1,322	1,117	3,644

Source: The Rubber Manufacturers Association, Inc.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1941	3,744,500	875,381	4,619,681	1951	5,337,729	1,420,432	6,758,161
1942	220,814	133,083	353,897	1952	4,320,794	1,212,790	5,533,584
1943	0	4,501	4,501	1953	6,121,787	1,202,196	7,323,983
1944	0	124,819	124,819	1954	5,558,897	1,038,045	6,596,942
1945	83,792	313,643	397,435	1955	7,920,186	1,245,018	9,165,204
1946	2,148,699	930,760	3,079,429	1956	5,816,109	1,100,417	6,916,525
1947	3,558,178	1,220,634	4,778,812	1957	6,113,344	1,097,006	7,210,350
1948	3,909,270	1,363,856	5,132,090	1958	4,257,812	874,278	5,132,090
1949	5,108,841	1,123,736	6,232,577	1959	5,591,243	1,134,858	6,726,101
1950	6,665,836	1,332,263	7,998,099	1960	6,674,796	1,193,769	7,860,565
1960:							
Jan.	676,712	115,268	791,980	July	421,355	79,444	500,799
Feb.	656,579	125,938	782,517	Aug.	324,020	65,948	389,968
Mar.	659,730	131,169	780,899	Sept.	386,694	77,038	463,732
Apr.	588,046	114,590	702,636	Oct.	627,678	75,034	702,712
May	607,191	118,023	727,214	Nov.	600,495	86,957	687,452
June	605,582	111,420	717,002	Dec.	520,714	92,940	613,654
1961:							
Jan.	406,616	79,039	485,655	July	———	———	———
Feb.	363,193	84,821	448,014	Aug.	———	———	———
Mar.	425,892	99,909	525,801	Sept.	———	———	———
Apr.	453,425	93,858	547,283	Oct.	———	———	———
May	539,858	101,406	641,264	Nov.	———	———	———
June	567,563	113,824	671,387	Dec.	———	———	———

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy

Automotive Inner Tubes

(Thousands of Units)

	Shipments					
Year	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1954	**25,071**	**35,576**	**945**	**61,593**	**48,279**	**9,519**
1955	**5,001**	**33,387**	**1,001**	**39,389**	**35,900**	**6,833**
1956	3,100	32,358	1,040	36,498	34,405	6,109
1957	3,046	35,687	1,076	39,806	39,774	80,077
1958	2,678	37,872	870	41,420	41,266	8,602
1959	3,624	41,522	891	46,037	46,059	10,536
1960	3,349	36,324	1,120	40,793	40,980	11,034
1960:						
Mar.	365	2,807	111	3,282	4,241	10,113
Apr.	330	2,862	114	3,306	3,628	10,495
May	307	2,932	91	3,330	3,611	10,852
June	295	3,154	98	3,547	3,444	10,700
July	242	3,103	94	3,440	3,261	10,627
Aug.	169	3,056	83	3,308	3,017	10,254
Sept.	232	2,563	100	2,894	3,024	10,446
Oct.	222	2,666	111	3,000	3,067	10,589
Nov.	229	2,354	74	2,657	2,921	10,859
Dec.	224	2,499	95	2,818	2,913	11,034
1961:						
Jan.	237	4,783	56	5,076	3,208	9,394
Feb.	231	2,987	58	3,276	3,140	9,246
Mar.	281	3,246	60	3,588	3,359	9,014
Apr.	299	2,533	70	2,902	2,939	9,096
May	306	2,424	65	2,795	3,190	9,487
June	297	2,970	57	3,323	2,838	8,948

Source: The Rubber Manufacturers Association, Inc.

Vinyl and Vinyl Copolymer Resins—Sales

(Thousands of Pounds—Resin Content)

	Polyvinyl Chloride and Copolymer Resins							All Other Vinyl Resins		
	Film	Sheeting	Molding & Extrusion	Textile & Paper Treating	Flooring	Protective Coatings	All Other Uses	Adhesives	All Other Uses	Grand Total
1956	78,063	55,598	206,726	62,931	65,384	28,522	71,859	36,565	115,151	720,799
1957	90,543	56,344	216,517	66,392	81,357	31,519	50.637	41,665	113,396	748,370
1958	72,404	67,594	214,701	63,050	113,583	28,913	68,307	52,904	117,752	801,208
1959	85,136	125,639	304,711	64,703	151,840	31,371	94,418	57,599	159,528	1,074,945
1960	98,917	126,881	284,520	62,452	161,106	38,577	112,415	59,105	151,857	1,105,380
1960:										
Dec.	7,948	8,638	22,065	5,175	15,194	2,887	11,304	5,087	12,391	97,813
1961:										
Jan.	7,311	10,615	23,417	5,150	12,866	2,902	7,725	4,501	11,952	86,439
Feb.	7,145	8,878	20,299	4,385	12,603	2,124	8,444	5,064	10,936	79,878
Mar.	8,905	9,036	24,780	4,943	14,887	3,089	11,407	5,683	12,347	95,077
Apr.	7,438	10,135	23,059	5,237	15,575	2,943	11,134	5,187	12,666	93,374
May	8,833	11,397	26,030	5,936	15,346	3,437	10,442	5,817	13,597	100,835
June	8,500	10,911	27,606	6,100	15,258	3,562	9,940	5,633	13,710	101,220

Source: Chemical Division, U. S. Tariff Commission.

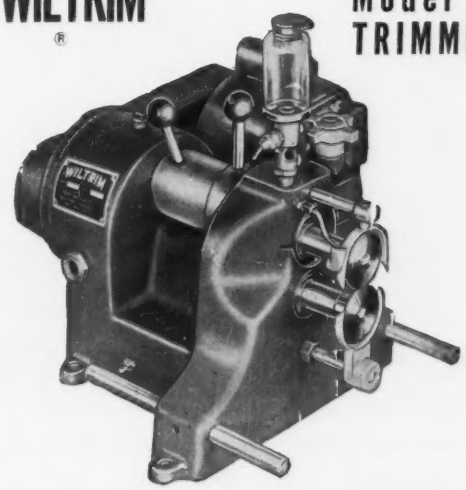
Manufacturers of CANARY LINERS

Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

WEST COAST REP.
R. D. Abbott Co., Inc.,
5268 Alhambra Ave.,
Los Angeles 32, California

J. J. WHITE Products Co.
7000 UNION AVENUE
CLEVELAND 5 OHIO

WILTRIM® Model DF TRIMMER



Wills forty-two years experience brings you this outstanding successor to the famous earlier Models D, DE and DM trimmers.

MACHINES ARE AVAILABLE FOR TRIAL

FERRY MACHINE COMPANY
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KENT, OHIO, U.S.A.
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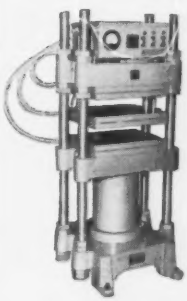
RUBBER MOLDERS PRAISE IT!

This Wabash Hydraulic Press features:



- Easy loading and unloading.
- Floating center platen to double the capacity.
- Accurate control of heated platens — heated independently.
- Fast closing and opening of platens.
- Four hard chrome - plated guide columns to resist wear from platen travel.
- Pyrometer, heat switches, pilot lights at eye level.
- Powerful hydraulic ram designed for years of trouble-free service — pressure to spare.
- Low initial cost — low maintenance cost — easy to operate.
- A number of these presses can be operated from a central power source.
- 50-ton model is shown — other models from 12 to 100-tons capacity.

Send for literature and names of users.

Wabash Metal Products Co.
1512 Morris Street, Wabash, Indiana
Phone: Wabash 583

Rubber Industry Employment Earnings and Hours

All Rubber Products

Mo.	1960 Production Workers (thousands)	1960 Average Weekly Earnings	1960 Average Weekly Hours	1960 Average Hourly Earnings	1961 Production Workers (thousands)	1961 Average Weekly Earnings	1961 Average Weekly Hours	1961 Average Hourly Earnings
Jan.	208.0	$102.16	40.7	$2.51	187.5	98.81	38.9	2.54
Feb.	208.6	100.00	40.0	2.50	180.8	97.27	38.6	2.52
Mar.	207.5	97.71	39.4	2.48	179.7	97.66	38.6	2.53
Apr.	200.7	94.60	38.3	2.47	180.8	100.47	39.4	2.55
May	197.6	100.04	39.7	2.52	184.2	....	....	....
June	197.9	102.72	40.6	2.53	....	....	....	....
July	191.7	103.53	40.6	2.55	....	....	....	....
Aug.	196.1	100.15	39.9	2.51	....	....	....	....
Sept.	197.8	98.28	39.0	2.52	....	....	....	....
Oct.	197.9	101.49	39.8	2.55	....	....	....	....
Nov.	192.6	99.57	39.2	2.54	....	....	....	....
Dec.	190.6	99.58	38.9	2.56	....	....	....	....
Tires and Tubes								
Jan.	77.9	119.80	40.2	2.98	70.4	113.54	38.1	2.98
Feb.	77.4	117.71	39.5	2.98	66.9	110.78	37.3	2.97
Mar.	78.8	113.68	38.8	2.93	68.1	111.53	37.3	2.99
Apr.	78.1	107.38	36.9	2.91	67.5	115.20	38.4	3.00
May	77.0	117.51	39.7	2.96	....	....	....	....
June	76.6	121.39	40.6	2.99	....	....	....	....
July	75.9	123.71	41.1	3.01	....	....	....	....
Aug.	75.7	114.66	39.0	2.94	....	....	....	....
Sept.	74.5	112.40	38.1	2.95	....	....	....	....
Oct.	73.8	117.00	39.0	3.00	....	....	....	....
Nov.	73.1	114.60	38.2	3.00	....	....	....	....
Dec.	71.5	118.59	39.4	3.01	....	....	....	....
Rubber Footwear								
Jan.	19.0	79.40	39.5	2.01	18.3	82.32	39.2	2.10
Feb.	19.0	77.21	38.8	1.99	18.9	85.60	40.0	2.14
Mar.	18.9	78.61	39.5	1.99	19.1	82.92	39.3	2.11
Apr.	18.5	77.01	38.7	1.99	19.3	86.65	40.3	2.15
May	18.1	81.40	40.1	2.03	....	....	....	....
June	18.2	82.82	40.6	2.04	....	....	....	....
July	17.6	82.21	40.3	2.04	....	....	....	....
Aug.	18.2	81.40	40.1	2.03	....	....	....	....
Sept.	18.5	79.18	39.2	2.02	....	....	....	....
Oct.	18.5	82.59	39.9	2.07	....	....	....	....
Nov.	17.4	82.16	39.5	2.08	....	....	....	....
Dec.	18.4	79.00	37.8	2.09	....	....	....	....
All Other Rubber Products								
Jan.	111.1	93.52	41.2	2.27	98.8	91.01	39.4	2.31
Feb.	112.2	91.76	40.6	2.26	95.0	90.16	39.2	2.30
Mar.	109.8	89.78	39.9	2.25	92.5	90.62	39.4	2.30
Apr.	104.1	88.43	39.3	2.25	94.0	92.80	40.0	2.32
May	102.5	90.12	39.7	2.27	....	....	....	....
June	103.1	92.34	40.5	2.28	....	....	....	....
July	98.2	91.66	40.2	2.28	....	....	....	....
Aug.	102.2	92.75	40.5	2.29	....	....	....	....
Sept.	104.8	92.10	39.7	2.32	....	....	....	....
Oct.	105.6	93.73	40.4	2.32	....	....	....	....
Nov.	102.1	92.17	39.9	2.31	....	....	....	....
Dec.	100.7	89.40	38.7	2.31	....	....	....	....

Source: U. S. Department of Labor.
Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who work during, or received pay for, any part of the pay period ending nearest the 15th of the month. These employment series have been adjusted to first quarter 1954 benchmark levels indicated by data from government social insurance programs. Hours and earnings data pertain only to production and related workers.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1954	1955	1956	1957	1958	1959	1960	1961
Jan.	34.16	35.07	35.24	34.82	36.31	35.67	33.09	32.25
Feb.	35.00	35.04	36.26	34.82	35.83	35.69	33.20	32.35
Mar.	35.23	34.33	36.70	35.35	36.05	35.71	33.54	33.27
Apr.	35.22	34.23	36.43	35.43	36.00	36.05	34.10	33.62
May	35.34	34.80	36.65	35.40	36.27	36.24	34.15	34.07
June	35.17	34.83	36.67	35.45	36.33	36.05	34.22	34.44
July	35.37	34.61	35.43	35.49	36.51	34.67	33.96	34.82
Aug.	35.19	34.53	34.31	35.15	36.36	33.17	32.59	....
Sept.	35.46	33.85	34.35	34.74	36.00	32.99	32.39	....
Oct.	35.24	33.93	34.45	35.09	36.23	32.77	32.21	....
Nov.	34.80	34.87	34.56	36.06	36.24	32.79	32.27	....
Dec.	35.03	34.95	34.56	36.50	35.75	33.02	31.60	....
Average for Year	35.10	34.59	35.50	35.36	36.16	34.57	33.10	....

Note: The Government established a ceiling of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

Production Index for the Rubber Industry

(1957 = 100)

(Based on man-hours)

	1959	1960	1961		1959	1960	1961
Jan.	108	118	103	July	128	117	....
Feb.	113	117	102	Aug.	120	115	....
Mar.	112	115	96	Sept.	120	111	....
Apr.	104	115	110	Oct.	116	110	....
May	105	117	114	Nov.	120	109	....
June	117	122	....	Dec.	120	105	....

Sales by the Rubber Industry

(in Millions of Dollars*)

	1959	1960	1961		1959	1960	1961
Jan.	508	530	450	July	519	480	....
Feb.	490	570	460	Aug.	492	480	....
Mar.	506	510	490	Sept.	544	510	....
Apr.	543	530	480	Oct.	555	490	....
May	524	550	500	Nov.	482	500	....
June	520	520	500	Dec.	500	470	....

Rubber Manufacturers' Inventories

(in Millions of Dollars*)

	1959	1960	1961		1959	1960	1961
Jan.	998	1,140	1,130	July	1,075	1,230	....
Feb.	1,022	1,140	1,130	Aug.	1,113	1,240	....
Mar.	1,030	1,160	1,120	Sept.	1,115	1,200	....
Apr.	1,015	1,190	1,130	Oct.	1,115	1,160	....
May	995	1,180	1,140	Nov.	1,120	1,140	....
June	1,013	1,200	1,130	Dec.	1,140	1,120	....

Source: U. S. Department of Commerce.
Notes: * Adjusted for seasonal variation.

No. 1 R.S.S.—Annual Average Prices

(New York Market—Cents per Pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1919	57	38½	48.70	1940	24	18¾	20.10
1920	56½	16	30.30	1941	24⅞	19⅛	22.40
1921	21¼	11½	16.36	1942	22½	22½	22.50
1922	28⅜	13⅜	17.50	1943	22½	22½	22.50
1923	37⅛	24¾	29.45	1944	22½	22½	22.50
1924	40⅛	17⅜	26.20	1945	22½	22½	22.50
1925	121	34⅜	72.40	1946	22½	22½	22.50
1926	88½	36¾	48.30	1947	25	14	20.00
1927	41¾	33	37.72	1948	25	18	21.99
1928	41¾	17	22.48	1949	19¾	15⅞	17.57
1929	26⅞	15½	20.55	1950	86	18	41.10
1930	16½	7½	11.98	1951	76	52	(a)
1931	8⅝	4¼	6.17	1952*	33	30½	29.15
1932	4¾	2½	3.49	1953	31⅜	19⅞	24.21
1933	9⅜	2⅞	5.96	1954	34½	19½	23.61
1934	15⅞	8¾	12.92	1955	52	29½	39.16
1935	13¾	10½	12.37	1956	45	26½	34.24
1936	23	13½	16.41	1957	37⅛	20⅝	31.13
1937	26⅞	14	19.39	1958	32⅝	24⅝	28.13
1938	17⅞	10¼	14.64	1959	49	29¾	36.56
1939	24	14⅛	17.57	1960	47½	28⅜	38.09

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947. (a) Free trading suspended March 31, 1951. GSA selling price ranged between 52 and 66c during balance of year. * Free trading was resumed on July 1, 1952; figures represent only July through December, 1952.

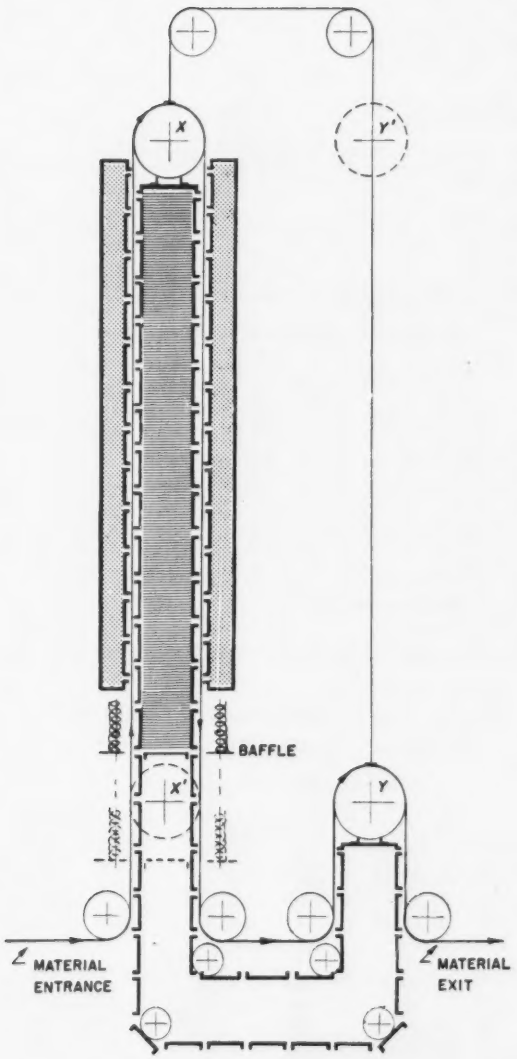
No. 1 R.S.S.—Monthly Average Prices

(New York Market—Cents per pound)

	1954	1955	1956	1957	1958	1959	1960	1961
Jan.	20.22	33.92	41.70	33.32	27.15	30.34	41.18	28.77
Feb.	19.98	34.90	33.68	30.43	26.32	30.26	39.33	29.00
Mar.	20.16	31.08	33.68	31.76	26.65	31.62	40.74	30.22
Apr.	22.06	31.75	31.75	32.23	26.44	33.72	40.35	31.21
May	21.96	31.35	29.61	32.12	25.51	36.48	43.62	32.04
June	23.01	34.74	30.54	32.80	26.20	34.31	45.70	30.04
July	24.12	40.84	33.91	32.88	27.70	35.19	40.90	29.46
Aug.	23.00	48.85	35.69	32.13	28.72	38.43	36.69	....
Sept.	23.00	48.27	32.64	29.94	29.49	40.22	35.04	....
Oct.	26.57	43.81	32.68	29.24	31.06	41.50	34.06	....
Nov.	28.07	44.95	35.18	27.47	32.10	45.16	30.63	....
Dec.	29.88	48.40	37.01	29.25	30.28	41.46	28.81	....
Average for Year	23.61	39.16	34.24	31.13	28.13	36.56	38.09	....

"ROLLEVATOR"®

VARIABLE LENGTH OVEN



SCHEMATIC VIEW OF DOUBLE SIDE IMPINGEMENT "ROLLEVATOR"®
PATENTED

HORIZONTAL OR VERTICAL STYLES
SINGLE OR DOUBLE SIDE IMPINGEMENT

HOW THE "ROLLEVATOR"® WORKS

DISTANCE *xy* IS CONSTANT AND EQUAL TO *x'y'*. MOVABLE ROLLS AT *x* AND AT *y* ARE COUNTER-BALANCED.

WHEN ROLL IN OVEN MOVES FROM POSITION *x* TO POSITION *x'*, THE ROLL IN AMBIENT ZONE MOVES AN EQUAL DISTANCE TO POSITION *y'*. THE ROLL IN OVEN IS AT *x* AT MAXIMUM PROCESS SPEED, AND AT *x'* AT STOPPAGE. AN INFINITE NUMBER OF POSITIONS IS OBTAINED BETWEEN POSITIONS *x* AND *x'* IN DIRECT PROPORTION TO LINE SPEED.

THE "ROLLEVATOR"® CAN WORK FOR YOU

YOU ARE ALWAYS "ON STREAM".
YOU GET UNIFORM PROCESSING OF EVERY INCREMENT OF MATERIAL THROUGH CONSTANT EXPOSURE.

YOU SET TEMPERATURE ONLY ONCE FOR ANY MATERIAL.
YOU CAN CHANGE PROCESS SPEED AT WILL.
YOU GET 100% USABLE MATERIAL EVEN ON EMERGENCY STOPS.

YOU DO NOT NEED TO—

- CHANGE TEMPERATURE
- WAIT FOR REHEATING
- HAVE ELABORATE QUICK COOLING
- HAVE COMPLEX FAN SYSTEMS
- HAVE ELABORATE OPERATIONAL PROCEDURES

LEGEND

— STATIONARY DUCTS
— MOVABLE DUCT

INDUSTRIAL OVENS, INC.
13803 TRISKETT ROAD CLEVELAND 11, OHIO

Various Compounding Materials Consumed by the Rubber Industry

Material	1953	1954	1955	1956	1957	1958	1959
Antimony, Primary							
Short tons	20c	49c	78	156	284	265	217
% of total	0.1	0.4	0.5	1.0	2.3	2.2	1.6
Asphalt: [a]							
Short tons	.....	.....	....	.....	.....	.....	.....
% of total	.....	.....	.....	.....	.....	.....	.....
Barite (Barytes):							
Short tons	21,000	20,000	25,104	22,101	21,782	18,387	19,806
% of total	2.0	2.0	2.0	2.0	1.0	2.0	2.0
Carbon Black:							
Short ton	566,797	511,831	643,430	622,325	635,781	625,469	731,619
% of total	94.4	93.5	93.5	95.5	45.5	95.3	95.5
Clay, Kaolin:							
Short tons	241,052	247,431	257,223	268,157	301,185	282,493	322,875
% of total	12.8	13.2	11.9	12.0	14.0	12.7	12.7
Clay, Fire & Stoneware:							
Short tons	18,475	8,781	2,928	.....	.....	.....	.....
% of total	.2	.1	.2	.....	.....	.....	.....
Lime:							
Short tons	1,631	1,555	1,465	2,487	2,799	2,533	5,549
% of total	(d)	(d)	(d)	(d)	(d)	(d)	(d)
Litharge:							
Short tons	2,230	1,768	1,947	2,266	1,298	1,247	1,808
% of total	1.4	1.3	1.3	1.7	1.7	1.4	1.0
Lithopone:							
Short tons	1,723	1,701	2,163	2,000[e]	.....	.....	.....
% of total	3.3	3.9	5.0	5.0	.....	.....	.....
Mica, Ground:							
Short tons	5,668	5,021	7,339	7,021	8,579	9,622	12,101
% of total	7.8	6.3	6.9	8.0	9.0	9.9	11.5
Sulfur:							
Short tons	89,600	84,000	89,600	89,600	89,600[e]	.....	.....
% of total	1.4	1.3	1.2....	1.1	1.1	.....	.....
Talc: [b]							
Short tons	61,408	58,139	38,309	30,253	28,532	36,889	42,187
% of total	10.0	9.7	5.4	5.0	6.0	5.5	5.4
Zinc Oxide:							
Short tons	78,439	71,058	86,677	80,459	81,745	68,176	79,505
% of total	52.7	50.7	51.5	51.9	54.0	50.1	51.5

Source: U. S. Bureau of Mines.
Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible. (e) Estimated.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	New Supply	Consumption: Tons	Consumption: % to Crude [a]	Exports	Stocks On Hand at End of Period
1946	**295,612**	**275,410**	**26.5**	**14,461**	**33,000**
1947	**291,395**	**288,395**	**24.8**	**14,556**	**35,943**
1948	**266,861**	**261,113**	**24.4**	**11,428**	**32,030**
1949	**224,029**	**226,679**	**24.5**	**10,037**	**28,263**
1950	**314,008**	**303,733**	**24.1**	**11,740**	**35,708**
1951	**366,700**	**346,121**	**26.6**	**14,722**	**45,082**
1952	**274,981**	**280,002**	**22.2**	**11,180**	**30,664**
1953	**298,336**	**285,050**	**21.3**	**11,597**	**32,319**
1954	**258,101**	**249,049**	**20.2**	**10,232**	**30,746**
1955	**326,649**	**312,781**	**20.4**	**13,988**	**31,498**
1956	**287,220**	**270,547**	**18.8**	**13,832**	**34,969**
1957	**271,647**	**267,352**	**18.2**	**13,021**	**29,323**
1958	**259,809**	**248,156**	**18.2**	**11,362**	**29,063**
1959	**303,479**	**286,410**	**20.0**	**11,757**	**27,738**
1960	293,106	278,763	17.9	13,678	33,048
1960:					
Jan.	26,532	26,540	18.9	1,106	29,031
Feb.	27,085	25,944	18.6	1,258	28,653
Mar.	29,114	26,625	18.4	1,542	29,719
Apr.	26,221	24,210	18.2	1,248	30,916
May	25,676	23,763	17.8	1,167	32,611
June	25,516	24,677	17.8	1,164	31,699
July	21,512	19,249	16.8	1,384	33,624
Aug.	23,540	21,452	16.3	951	33,979
Sept.	22,306	22,101	17.8	1,028	33,949
Oct.	23,546	23,269	18.5	804	33,519
Nov.	22,023	21,014	17.2	1,167	33,783
Dec.	20,010	19,921	17.8	859	33,048
1961:					
Jan.	22,528	22,052	18.2	1,084	33,101
Feb.	19,724	18,550	17.0	1,208	33,493
Mar.	21,824	20,558	17.0	1,073	32,695
Apr.	21,406	20,736	17.9	1,349	31,593
May	23,317	21,989	19.5	----	31,663

Source: U. S. Department of Commerce.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (a) Includes natural and synthetic rubber.

Cotton, Rayon and Nylon Tire Fabrics

(In Thousands of Pounds)

	Production: Rayon Tire Cord Net Woven	Production: Rayon Tire Cord Woven	Production: Cotton and Nylon Cord & Fabric [a]	Production: Chafer Fabrics (all fibers)	Production: Total Tire Cord and Fabric	Stocks [b]: Cotton and Nylon Cord & Fabric	Stocks [b]: Rayon Cord and Fabric
1960:							
Jan.-Mar.	68,699	68,699	45,461	11,389	116,816	15,676	36,841
Apr.-June	64,692	64,692	49,841	10,527	117,299	15,337	33,905
July-Sept.	51,830	51,833	39,299	7,728	93,101	18,347	31,191
Oct.-Dec.	54,388	54,388	34,438	7,217	91,223	16,532	25,143
Total	239,609	239,609	169,039	36,856	418,439	65,892	127,080
1961:							
Jan.-Mar.	56,287	56,287	37,459	8,378	95,934	14,580	25,574
Apr.-June	45,303	45,303	49,212	8,020	97,262	19,021	22,546
July-Sept.	.....	.....	.....	.....	.....	.....	.....
Oct.-Dec.	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	.....

Source: Bureau of the Census, U. S. Department of Commerce.
Notes: (a) Combined to avoid disclosing figures for individual companies. (b) At end of period.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1955	1956	1957	1958	1959	1960	1961
Jan.	96,397	100,642	109,295	107,281	114,720	111,311	114,455
Feb.	88,464	98,088	96,694	95,516	99,759	108,871	105,589
Mar.	105,684	112,412	113,166	108,914	118,995	120,497	126,592
Apr.	111,116	113,034	115,820	118,477	124,917	129,094	119,188
May	115,707	123,560	124,325	125,137	127,049	129,952	137,153
June	120,710	126,833	121,598	125,444	133,695	138,909	.....
July	115,653	120,708	130,251	130,903	137,141	135,838	.....
Aug.	121,816	125,847	128,808	129,925	132,875	138,371	.....
Sept.	113,379	111,574	113,567	120,389	130,264	128,530	.....
Oct.	112,558	119,204	119,334	125,097	120,858	126,242	.....
Nov.	109,212	112,113	107,705	110,587	116,056	124,855	.....
Dec.	111,034	108,096	112,691	120,305	123,587	124,937	.....
Total	1,321,730	1,372,116	1,393,254	1,417,975	1,479,907	1,517,407	.....

Source: U. S. Bureau of Mines.

U. S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

Year	Balata: Tons	Balata: Value	Jelutong: Tons	Jelutong: Value	Gutta-Percha & Other Guttas: Tons	Gutta-Percha & Other Guttas: Value
1956	**1,396**	**1,111,165**	**1,851**	**1,909,447**	**290**	**309,615**
1957	**1,037**	**670,821**	**1,680**	**1,942,067**	**230**	**270,487**
1958	**745**	**536,820**	**1,501**	**1,698,840**	**157**	**224,499**
1959	**1,512**	**1,350,843**	**1,296**	**1,608,986**	**268**	**311,178**
1960	2,531	2,632,102	941	1,026,244	320	528,916
1960:						
Apr.	56	35,560	97	104,711	18	33,181
May	86	79,553	76	88,209	64	90,252
June	75	59,506	128	142,962	35	45,136
July	108	144,740	68	76,761	24	56,317
Aug.	207	213,484	88	99,726	35	55,090
Sept.	960	540,589	26	27,889	28	38,363
Oct.	420	659,078	39	41,574	11	13,230
Nov.	365	534,852	51	58,977	29	74,331
Dec.	26	64,983	82	97,396	13	37,166
1961:						
Jan.	117	221,468	31	35,439	39	91,191
Feb.	54	94,584	31	106,564	19	45,083
Mar.	45	74,157	42	57,455	1	9,081
Apr.	101	57,779	96	130,173	18	44,094

Source: U. S. Department of Commerce.

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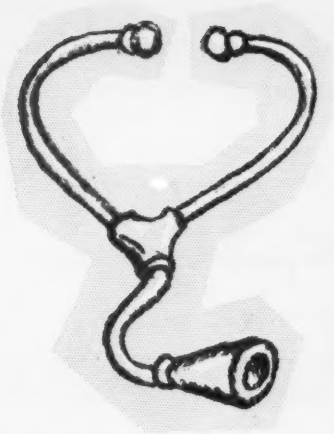

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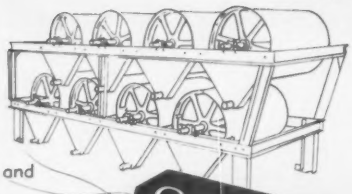

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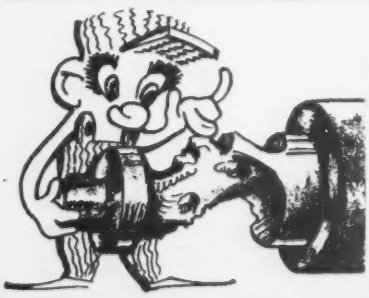

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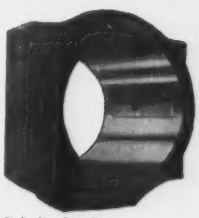

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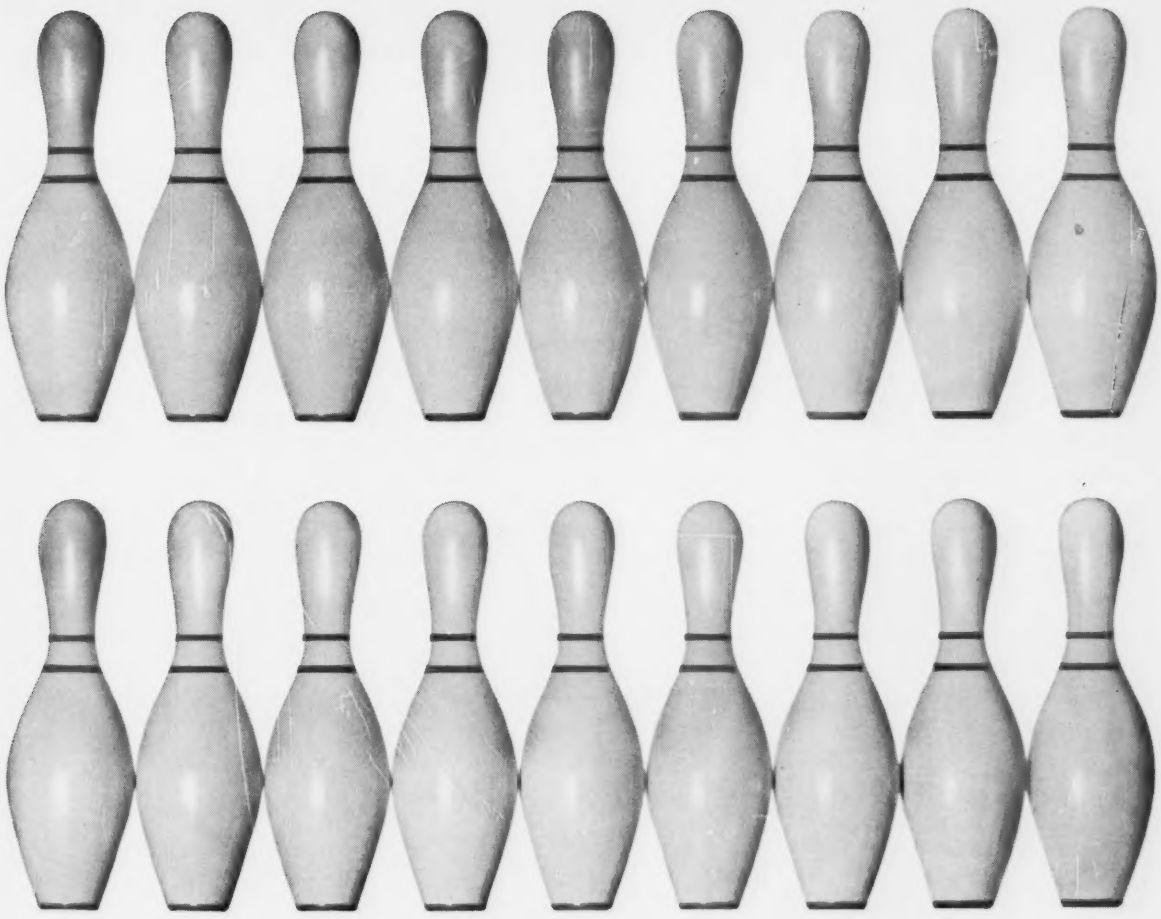

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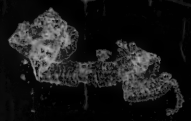

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